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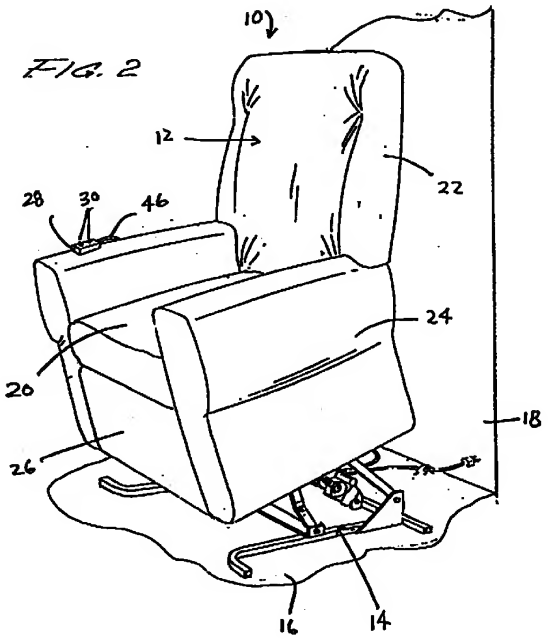
(54) Power actuated reclining chair with wall-hugger function

(57) A reclining chair has a backrest and a seat, which includes a front seat portion and a rear seat portion. The chair is carried on a mechanized base. The base carries an actuator, which is coupled to a reclining linkage assembly. The reclining linkage assembly applies force in response to operation of the actuator to advance the seat and backrest forward while also tilting the backrest rearward from a generally upright position to a generally reclined position. Advancing the seat and backrest forward while the backrest reclines, keeps the distance between the backrest and an adjacent wall generally constant, regardless of whether the backrest is in the generally upright position and in the generally reclined position. The actuator can also operate a lifting linkage assembly for lifting the seat and tilting the seat forward to assist exit from the chair. A locking mechanism resists extension of an associated footrest linkage when the seat is lifted and tilted forward.



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Description

Field of the Invention

[0001] The invention relates to chairs, and more particularly to power actuated reclining chairs having a wall-hugger function.

Background of the Invention

[0002] Manual "wall-hugger" style chairs are popular, because they do not require any more clearance between the backrest and a nearby wall in a normal seated position than in a fully reclined position. As a result, they conserve space in a room.

[0003] Power actuated lifting and reclining chairs are well known. See, for example, Gaffney U.S. Patent No. 4,007,960. These chairs have, in the past, allowed elderly or infirm persons to enjoy all the comforts and benefits of then conventional reclining chairs. The elderly or infirm should also have the opportunity to enjoy all the comfort and benefits of wall-hugger style chairs.

[0004] Unfortunately, the special mechanisms that make conventional, manual wall-hugger style chairs possible do not readily lend themselves to straightforward, reliable, and inexpensive connection to conventional power actuated lift and recline mechanisms.

Summary of the Invention

[0005] One aspect of the invention provides a mechanized base for a reclining chair, which provides a reliable, straightforward, power-driven reclining function with a wall-hugging feature. The reclining chair has a backrest and a seat, which includes a front seat portion and a rear seat portion. The base carries an actuator, which is coupled to a reclining linkage assembly.

[0006] In one embodiment, the reclining linkage assembly includes a forward thrust bar on the base adapted to be coupled to the front portion of the seat. In this embodiment, the reclining linkage assembly is operable, in response to operation of the actuator, for applying a pushing force to the forward thrust bar to advance the seat and backrest forward while tilting the backrest rearward from a generally upright position to a generally reclined position. Pushing the seat and backrest forward while the backrest reclines, keeps the distance between the backrest and an adjacent wall generally constant when the backrest is in the generally upright position and in the generally reclined position.

[0007] In a preferred embodiment, the actuator on the base is operable in first and second modes. In this embodiment, a lifting linkage assembly coupled to the actuator is also adapted to be coupled to the seat. In use, the lifting linkage is operable, when the actuator operates in the first mode, for lifting the seat and tilting the seat forward to assist exit from the chair. In this embodiment, the reclining linkage assembly is operable, when the actuator operates in the second mode, for applying force to move the seat and backrest forward while tilting the backrest rearward for recline.

[0008] The mechanized base provided by the invention readily accommodates a reclining chair construction in which the backrest and seat are secured together at a fixed angle. The mechanized base just as readily accommodates a reclining chair construction in which the backrest pivots relative to the seat.

[0009] The mechanized base also accommodates a reclining chair having an extendable footrest. In this embodiment, the reclining linkage assembly is linked to the footrest to extend the footrest as the seat and backrest are pulled forward for recline.

[0010] Another aspect of the invention provides a chair comprising a seat, a footrest linkage associated with the seat to operable between a retracted position and an extended position, and a base. An actuator on the base is coupled to a lifting linkage assembly, which is coupled to the base and the seat. The lifting linkage assembly is operable, in response to operation of the actuator, for lifting the seat and tilting the seat forward to assist exit from the chair. According to this aspect of the invention, the chair includes a mechanism to resist movement of the footrest linkage out of the retracted position when the seat is lifted and tilted forward.

[0011] Other features and advantages of the inventions are set forth in the following Description and Drawings, as well as in the appended claims.

Brief Description of the Drawings

[0012]

Fig. 1 is a perspective front side view of a reclining chair carried on a mechanized base, which embodies features of the invention, the chair being shown in a normal seated position on the base;

Fig. 2 is a perspective front side view of the reclining chair shown Fig. 1, except that the chair is shown in an elevated position, lifted above the mechanized base;

Fig. 3 is a perspective front side view of the reclining chair shown Fig. 1, except that the chair is shown in a reclined position on the base;

Figs. 4A, 4B, and 4C are exploded rear side perspective views of one embodiment of the mechanized base which the chair shown in Fig. 1 incorporates, with Fig. 4A showing the chair frame support unit, Fig. 4B showing the bottom base unit, and Fig. 4C showing the assembly of the chair frame support unit on the bottom base unit, forming the mechanized base;

Fig. 5 is a rear side perspective view of the bottom base unit of the mechanized base with the components oriented when the chair is in the normal seated position shown in Fig. 1;

Figs. 6 and 7 are rear side perspective views of the

bottom base unit of the mechanized base with the components oriented when the chair is being elevated, with Fig. 6 showing a partially elevated position and Fig. 7 showing a fully elevated position, generally corresponding to the attitude of the chair shown in Fig. 2;

Figs. 8 and 9 are rear side perspective views of the bottom base unit of the mechanized base, with portions of the chair frame support unit also shown, with components oriented when the chair is being reclined, with Fig. 8 showing a partially reclined position and Fig. 9 showing a fully reclined position, generally corresponding to the attitude of the chair shown in Fig. 3;

Fig. 10 is a side elevation view of the mechanized base, with portions broken away and presented in phantom lines to enable clear viewing, showing the orientation of components when the chair is in a normal seated position, generally corresponding to Fig. 1;

Fig. 11 is a side elevation view of the mechanized base, with portions broken away and presented in phantom lines to enable clear viewing, showing the orientation of components when the chair is in an elevated position, generally corresponding to Fig. 2;

Fig. 12 and 13 are a side elevation views of the mechanized base, with portions broken away and presented in phantom lines to enable clear viewing, showing the orientation of components when the chair is in a partially reclined position (Fig. 12) and a fully recline position (Fig. 13), generally corresponding to Fig. 3;

Fig. 14 is a side elevation view of another embodiment of a mechanized base, which embodies features of the invention, with portions broken away and presented in phantom lines to enable clear viewing, showing the orientation of components when the chair is in a normal seated position;

Fig. 15 is a side elevation view of the mechanized base shown in Fig. 14, with portions broken away and presented in phantom lines to enable clear viewing, showing the orientation of components when the chair is in a partially reclined position;

Fig. 16 is a side elevation view of the mechanized base shown in Fig. 14, with portions broken away and presented in phantom lines to enable clear viewing, showing the orientation of components when the chair is in a fully reclined position;

Fig. 17 is a rear side perspective view of the mechanized base shown in Figs. 14 to 16;

Fig. 18 is a rear perspective view of another embodiment of a mechanized base which the chair shown in Fig. 1 can incorporate, showing the assembly of a chair frame support unit on the bottom base unit, forming the mechanized base, which is shown in a normal seated condition;

Fig. 19 is a rear perspective view of the mechanized base shown in Fig. 18, with the base in a partially reclined condition;

Fig. 20 is a rear perspective view of the mechanized base shown in Fig. 18, with the base in a fully reclined condition, generally corresponding to claim 3;

Fig. 21 is a side elevation view of the mechanized base shown in Fig. 18 taken generally along line 21-21 in Fig. 18, showing the orientation of components when the chair is in a normal seated position, generally corresponding to Fig. 1;

Fig. 22 is a side elevation view of the mechanized base shown in Fig. 21, showing the orientation of components when the chair is in an partially elevated position;

Fig. 23 is a side elevation view of the mechanized base shown in Fig. 21, showing the orientation of components when the chair is in a fully partially elevated position, generally corresponding to Fig. 2;

Figs. 24 and 25 are enlarged perspective views showing a mechanism for locking a lazy tongs linkage when the chair shown in Fig. 21 elevated, Fig. 24 showing the orientation of the locking mechanism when the chair is partially elevated (as also shown in Fig. 22), and Fig. 24 showing the orientation of the locking mechanism when the chair is fully elevated (as also shown in Fig. 23);

Fig. 26 is a rear perspective view of a mechanized base having the features of the base shown in Fig. 18, but adapted to accept a preassembled reclining chair;

Fig. 27 is a front perspective view of a mechanized base, shown in an elevated position, which is adapted to accept a preassembled reclining chair and which includes a swinging link that applies a dynamic counter force to the reclining mechanism of the chair when the chair is being elevated, to thereby lock the footrest in a retracted condition;

Fig. 28 is a side elevation view of the base shown in Fig. 27, with the swinging link shown in a transfer position to place the chair in a normal seated position; and

Fig. 29 is a side elevation view of the base shown in Fig. 28, with the swinging link shown in a fully rotated position to recline the chair.

[0013] The invention may be embodied in several forms without departing from its spirit or essential characteristics. The scope of the invention is defined in the appended claims, rather than in the specific description preceding them. All embodiments that fall within the meaning and range of equivalency of the claims are therefore intended to be embraced by the claims.

Description of the Preferred Embodiments

[0014] Figs. 1 to 3 show a power actuated lifting and reclining chair 10, which embodies features of the invention. The chair 10 comprises an upholstered chair

body 12 carried on a mechanized base 14(see Fig. 2). As shown in Figs. 1 to 3, the chair 10 which is supported on a floor 16 in proximity to a wall 18.

I. The Chair Body

[0015] The chair body 12 is typical of most chairs in residential use. The chair body 12 includes a seat 20, a backrest 22, and side arms 24. In the illustrated embodiment, the chair body 12 also includes an extendable footrest or ottoman 26. Still, the presence of the footrest 26 is not essential to the features of the invention.

[0016] Fig. 1 shows the chair body 12 in a typical, normal seated position. In this position, the backrest 22 is in a generally upright, or perhaps somewhat tilted back, condition. This position provides comfort to an occupant for normal seating in the chair body 12.

[0017] The mechanized base 14 is coupled to a hand-held controller 28. The controller has one or more control buttons 30. The occupant presses the control buttons 30, which drives the mechanized base 14 and alters the position of the chair body 12.

[0018] The mechanized base 14 operates in two modes, which will be called the lift mode and the reclined mode.

[0019] In the lift mode (exemplified in Fig. 2), the mechanized base 14 elevates the seat 20 of the chair body 12 from the normal seated position. Preferably, in the lift mode, the mechanized base 14 also tilts the seat slightly downward, toward the floor 16.

[0020] As shown in Fig. 2, the backrest 22 and side arms 24 are all elevated in common with the seat 20. Still, it should be recognized that the chair body 12 could be constructed to enable elevating the seat 20 during the lift mode without raising the backrest 22 or the side arms 24.

[0021] The lift mode is designed to aid persons who lack the physical strength or dexterity to push themselves comfortably from the chair seat 20 into a standing position. The lift mode brings the occupant in the seat 20 up to or near a full standing position, to thereby facilitate exit from the chair body 12. In reverse, the lift mode lowers a person from a standing position to the normal seated position.

[0022] In the recline mode (exemplified in Fig. 3), the mechanized base 14 tilts or swings the backrest 22 of the chair body 12 rearward, from the upright position (Fig. 1) through a range of reclined positions to a preset fully reclined position (Fig. 3). Using the controller 28, the occupant can stop the backrest 22 at any position between the upright position and the fully reclined position.

[0023] The recline mode is designed to give a range of comfortable positions to the occupant while seated for various activities, such as reading, watching television, resting, or sleeping.

[0024] As shown in Fig. 3, during the recline mode, the mechanized base 14 also causes the footrest 26 to extend out from the front of the seat 20. The footrest 26 provides added support for the occupant's legs, lifting the legs to enhance blood circulation while enjoying a reclined position.

[0025] The details of the reclining action of the backrest 22 in relation to the seat 20 during the recline mode can vary, according to the construction of the chair body 12. For example, the backrest 22 can, during all or a portion of the recline, move relative to the seat 20. This is known in the industry as a "three-way" chair construction, in which the seat 20 and backrest 22 are pivotally hinged together.

[0026] For an other example, the seat 20 and backrest 22 can be secured together in a fixed relationship, so that, during recline, they move as a unit, maintaining a fixed angle between them. This is known in the industry as a "two-way" chair construction.

[0027] The selection of a particular chair construction depends upon individual preference. The mechanized base 14 can readily accommodate both types of chair constructions, as will be demonstrated.

[0028] As Figs. 1 to 3 show, during the recline mode, the mechanized base 14 provides a wall-hugger function. More particularly, the distance D_{WALL}, measured between the top of the backrest 22 and the adjacent wall 18, remains generally the same, whether the backrest 22 is in the normal seated position or in the fully reclined position.

II. The Mechanized Base (Three-Way, Base-Assembled, Rear Thrust Embodiment)

[0029] Details of one preferred embodiment of the mechanized base 14 will now be discussed, with reference first primarily to Figs. 4A, 4B, and 4C.

[0030] The mechanized base 14 includes a bottom base unit 32 (shown in Fig. 4B) and a chair frame support unit 34 (shown in Fig. 4A). In this particular embodiment, the bottom base unit 32 and the chair frame support unit 34 are conveniently joined by five bolts B1, B2, B3, B4, and B5 to create the mechanized base 14 (shown in Fig. 4C).

A. The Bottom Base Unit

[0031] Referring principally to Fig. 4B, the bottom base unit 32 includes a base frame 36. A back brace 38 is welded or otherwise fastened across the rear of the base frame 36 to provide strength and stability.

[0032] The back brace 38 carries a single actuator 40. In the illustrated embodiment, the actuator 40 comprises a single electric motor 42 driving a single extendable ram 44. The controller 28 (previously described) is coupled by a cable 46 to the motor 42. A power cable 48 couples the motor 42 to a conventional electrical power outlet (not shown).

[0033] In the illustrated embodiment, the extendable ram 44 includes a driver 50 driven by a conventional,

rotating lead screw 52. The lead screw 22 is coupled to the motor 42 by a right angle speed reducer 54. The driver 50 includes a drive nut 60, which threadably engages the lead screw 52. The ram 44 is pivotally connected on a pintle 56 to an actuator mount 58, which is welded or otherwise fastened to the back brace 38. As used in this Specification, a "pintle" identifies a pin or bolt or other equivalent fastening element about which the attached part can pivot.

[0034] Operation of the control buttons 30 on the controller 28 command the motor to cause clockwise or counterclockwise rotation of the lead screw. When the motor 42 rotates the lead screw 52 in a first direction (e.g., clockwise), the nut 60 advances the driver 50 in a first direction (designed by arrow 1 in Fig. 4B), which in the illustrated embodiment is away from the motor 42. For point of reference, this direction will be called the forward or fore direction.

[0035] Conversely, when the motor 42 rotates the lead screw in a second direction (e.g., counterclockwise), the nut 60 advances the driver 50 in a second direction (designated by arrow 2 in Fig. 4B), which in the illustrated embodiment is toward the motor 42. For point of reference, this direction will be called the rearward or aft direction.

[0036] Although the actuator 40 is shown in the illustrated embodiment to be a motor-driven ram, other power-actuated mechanisms can be used. For example, a hydraulic or a pneumatic ram can be used instead of the motor-driven ram.

[0037] As also shown in Fig. 4B, the bottom base unit 32 carries a forward pair of lift arms 62. The forward lift arms 62 are pivotally connected on pintles 66 to the bottom base unit 32 by a front brace 64. The front brace 64 is welded or otherwise fastened across the base frame 36, to provide additional strength and stability.

[0038] The bottom base unit 32 also includes a pair of rear lift arm mounts 68. The rear lift arm mounts 68 are welded or otherwise secured to the back portion of the base frame 36, adjacent the back brace 38.

B. The Chair Frame Support Unit

[0039] Referring now principally to Fig. 4A, the chair frame support unit 34 includes a pair of upper and lower side plates, respectively 70 and 72. The upper side plates 70 are coupled to the lower side plates 72 by spaced apart front and rear seat links, respectively 74 and 76. The seat links 74 and 76 are pivotally connected on pintles 78 at their opposite ends to the upper and lower side plates 70 and 72. The upper support plates 70 swing on the lower support plates 72 in fore and aft directions on the front and rear seat links 74 and 76, as will be shown in greater detail later.

[0040] A front brace 80 is coupled by fasteners 82 or welding across the upper support plates 70 to provide structural strength and stability. A rearward thrust bar 88, which is also coupled by fasteners 84 or welding to brackets 86 carried by the rear seat links 76, provides a similar function at the rear of the upper support plates 70. The rearward thrust bar 88 and seat links 74 and 76 also serve an important force transfer function during the recline mode, as will be described in greater detail later.

[0041] Flanges 92 on the upper support plates 70 are secured by suitable fasteners 90 to the seat 20 of the chair frame 12 (as Fig. 10 best shows). The side arms 24 are secured by suitable fasteners 96 to flanges 94 to the lower support plates 72 (as Fig. 10 also best shows).

[0042] In the embodiment shown in Figs. 4A to 4C, it is contemplated that, the seat 20, side arms 24, and backrest 22 will be assembled on the chair frame support unit 34 as individual component parts, and are not preassembled into a chair body 12 before their attachment to the support unit 34.

[0043] If a two-way chair construction is desired, the backrest 22 is secured directly to the chair seat 20 on the upper support plates 70 by a conventional bracket (not shown). Alternatively, or in combination with a direct seat-to-backrest connection, a pair of fixed (i.e., not pivotable) back mounts carried on rear of the upper support plates 70 can be provided (like those identified by reference numeral 98 in Fig. 4A, only secured in a not pivoting fashion). The backrest 22 can be attached by suitable fasteners (not shown) to the fixed back mounts.

[0044] If a three-way chair construction is desired, a pair of pivoting back mounts 98 can be pivotally connected on pintles 102 at the rear of the upper support plates 70 and connected by back links 142 to cause pivoting of the backrest 22 relative to the seat 20. Further details concerning the pivoting back mounts 98 will be described later.

[0045] A lift bar 104 is welded or otherwise fastened across the front of the lower support plates 72. Fig. 5 shows an unobstructed view of the lift bar, with certain adjacent components removed for the purpose of illustration.

[0046] As shown in Fig. 4A, a pair of rearward lift arms 110 are pivotally connected on pintles 174 to mounts 106, which welded or otherwise fastened to the lift bar 104. A lift arm brace 108 is welded or otherwise fastened across the rearward lift arms 110 to provide added structural strength and stability.

[0047] As Fig. 4C shows, the pair of rearward lift arms 110 are pivotally coupled at their other ends by the two bolts B1 and B2 to the rear pair of lift arm mounts 68 on the bottom base unit 32. In like manner, the free ends of the forward pair of lift arms 62 (on the bottom base unit 32) are pivotally coupled by the two bolts B3 and B4 to the front of the lower support plates 72 (see Fig. 4C). These four bolts B1, B2, B3, and B4 conveniently couple the chair frame support unit 34 to the bottom base unit 32.

[0048] Referred back to Fig. 4A. the lift bar 104 also

carries a pair of thrust brackets 112, which are also shown in an unobstructed view in Fig. 5. The thrust brackets 112 are welded or otherwise secured at equally spaced distances from the middle of the lift bar 104.

[0049] A pair of thrust rocker arms 114 are pivotally connected by pintles 116 to the thrust brackets 112. The thrust rocker arms 114 can rotate clockwise and counterclockwise about the pintles 116, unless otherwise restrained, as will be described in greater detail later.

[0050] A forward thrust bar 118 is coupled by welding or suitable fastening to the front of the thrust rocker arms 114, for movement on the rocker arms about the pintles 116. The forward thrust bar 118 carries a front actuator mount 120, which is welded or otherwise secured to it.

[0051] As Fig. 4C shows, the free end of the driver 50 of the actuator 40 is pivotally connected by the bolt B5 to the front actuator mount 120. The bolt B5 operatively couples the chair frame support unit 34 to the single actuator 40.

[0052] As Fig. 4A shows, the rearward thrust bar 88 (previously described) is pivotally connected on pintles 122 to the ends of a pair of rear thrust links 124. The opposite ends of the rear thrust links 124 are connected on pintles 126 to the lower portion of the thrust rocker arms 114.

[0053] As Fig. 4C shows, the rear thrust links 124 operatively couple the rearward thrust bar 88 (through the pivotally connected thrust rocker arms 114, the forward thrust bar 118, and the mount 120) to the single actuator 40. The thrust rocker arms 114 (and, with it, the forward thrust bar 118) are coupled to the upper and lower support plates 70 and 72 by the rear thrust links 124, the rear thrust bar 88, and the rear seat links 76.

C. Operation of the Mechanized Base

[0054] The foregoing connections between the components of the bottom base unit 32 and the chair frame support unit 34 make possible the realization of both lift and recline modes using the single actuator 40, while also providing the wall-hugger feature.

1. Normal Seating Position

[0055] Figs. 5 and 10 show the orientation of principal operating components of the bottom base unit 32 and the chair frame support unit 34 when the chair body 12 is in its normal seated position (which also generally corresponds with the orientation of the chair body in Fig. 1).

[0056] In this condition, the lift bar 104 rests on the base frame 36. The rearward lift arms 110 rest generally parallel to and on the base frame 36.

[0057] Also, in this position, the actuator 40 has an effective neutral length L1, as measured between the rear mount 58 and the forward mount 120. The position of the actuator 40 when in this length L1 will be called the transfer position, because it constitutes the transition between the lift mode and the recline mode.

ii. Lift Mode

[0058] Figs. 6, 7, and 11 show operation of the mechanized base 14 in the lift mode. The lift mode begins with the actuator 40 in the transfer position shown in Figs. 5 and 10.

[0059] Referring first to Fig. 6, the motor 42 is commanded to turn the lead screw 52 in a first direction (e.g., clockwise, as the arrow 128 in Fig. 6 shows). The driver 50 advances in the first (forward) direction along the lead screw 52, as the arrow 130 in Fig. 6 shows. The length of the actuator 20 increases beyond L1, applying a force F_{LIFT} to the mount 120. The lift mode commences.

[0060] The forward force F_{LIFT} is applied directly to the forward thrust bar 118. In the transfer position shown in Fig. 5, pivotal motion of the thrust rocker arms 114 in a counterclockwise direction is restrained, because the thrust rocker arms 114 are effectively locked to the upper and lower support plates 70 and 72 by the intermediate rear thrust links 124, the rear thrust bar 88, and rear seat links 76. As a consequence, the force F_{LIFT} created by the extending actuator 40 pivots the actuator 40 in a clockwise direction about its mount 58 (as shown by arrows 180 in Figs. 6 and 7). The clockwise pivot is transferred by the forward thrust bar 118 to the lift bar 104, which also pivots on the rearward lift arms in a clockwise direction about the mounts 68 in synchrony with the actuator 40.

[0061] As Fig. 11 shows, as the actuator 40 progressively increases in length and pivots clockwise on the base frame 36, the lower support plate 72, and, with it, the upper support plate 70, are lifted in tandem by the lift bar 104. The upper and lower support plates 70 and 72 pivot on the forward and rearward lift arms 62 and 110. As Fig. 11 shows, the entire chair body 12 support unit, and with it, the chair body 12 itself, is elevated above the base frame unit.

[0062] As Fig. 11 also shows, the forward lift arms 62, which are coupled to the front of the elevated lower support plates 72, are shorter than the rearward lift arms 110, which are coupled to the elevating lift bar. The assemblage of the shorter forward lift arms 62 and longer rearward lift arms 100 to the base frame 36 and the lower support plates 72 creates a non-parallelogram linkage 132. The non-parallelogram linkage 132 causes the upper and lower support plates 72 and 74 to tilt forward toward the floor 16 as they are elevated. As a result, the chair seat 20, carried by the upper support plate 70, tilts forward to the same extent. The relative differences in lengths and the spacing between the forward lift arms 62 and the rearward lift arms 110 govern the angle of the forward tilt.

[0063] When a preset fully elevated position is

achieved (which is shown in Figs. 7 and 11), a limit switch on the motor 42 stops further clockwise rotation of the lead screw 52.

[0064] In this fully lifted position (see Figs. 7 and 11), the actuator has an new effective length L2, as measured between the mounts 68 and 120. The new length L2 is longer than neutral length L1 of the actuator 40 when in the transfer position.

[0065] Subsequent operation of the motor 42 to turn the lead screw 52 counterclockwise causes the driver 50 to travel in a second direction, which will be called a rearward direction, along the lead screw 72. The effective length of the actuator 40 decreases from L2 back toward L1.

[0066] The rearward travel of driver 50 transfers a force F_{LOWER} to the mount 120. The force F_{LOWER} created by the shortening actuator 40 pivots the actuator 40 in a counterclockwise direction about its mount 58. The counterclockwise pivot force is transferred by the forward thrust bar 118 to the lift bar 104, which also pivots on the rearward lift arms in a counterclockwise direction about the mounts 68 in synchrony with the actuator 40.

[0067] As the actuator 40 shortens in length from L2 toward L1 and pivots counterclockwise on the base frame 36, the lower support plate 72, and, with it, the upper support plate 70, are lowered in tandem by the lift bar 104, pivoting on the forward and rearward lift arms 62 and 110. The entire chair body 12 support unit, and, with it, the chair body 12 itself, descend toward the base frame unit.

[0068] During the descent, the forward and rearward lift arms 62 and 110 tilt the seat 20 rearward as the chair body 12 returns to it's the normal seated position. At this point, the actuator has resumed its original effective length L1, and is again at its transfer position.

iii. Recline Mode

[0069] Figs. 8, 9, 12, and 13 show operation of the mechanized base 14 in the recline mode.

[0070] The recline mode begins, with the actuator 40 in the transfer position, and the chair body 12 in a normal seating position (as shown in Figs. 5 and 10). Referring to Fig. 8, the motor 42 is commanded to turn the lead screw 72 in a second direction (i.e., a direction different than the direction of the lift mode, which is clockwise in the illustrated embodiment, as the arrow 134 in Fig. 8 shows). The driver 50 travels in the second (rearward) direction along the lead screw 52, as the arrow 136 in Fig. 8 shows. The length of the actuator 20 shortens from L2, applying a force $F_{RECLINE}$ to the mount 120. The recline mode commences.

[0071] The force $F_{RECLINE}$ is applied directly to the forward thrust bar 118. In the transfer position shown in Fig. 5, pivotal motion of the thrust rocker arms 114 in a clockwise direction is not restrained. Thus, rearward travel of the driver 50 past the transfer position pulls rearward on the forward thrust bar 118, causing the thrust rocker arms 114 to rotate about the pintles 116 in a clockwise direction (as shown by the arrow 182 in Fig. 8).

[0072] As Figs. 8 and 9 show, as the actuator 40 progressively shortens, the clockwise pivot of the thrust rocker arms 114 about the pintles 116 , pulls the rear thrust links 124 forward. This force, in turn, pulls the rearward thrust bar 88 forward. The forward pulling force is transferred by the rear seat links 124 to the upper support plates 70, which are advanced forward on the front and rear links 74, accordingly. Figs. 12 and 13 also show the forward travel of the upper support links 70 created by the pulling force on the rearward thrust bar 88, as the lower side plates 72 remain stationary. As Figs. 12 and 13 show, the seat 20 (coupled to the upper support plates 70) thereby moves forward, while the side arms (coupled to the lower support plates 72) remain stationary.

[0073] As Figs. 12 and 13 also show, the front seat links 74 are longer than the rear seat links 76. The assemblage of the front and rear seat links 74 and 76 to the upper and lower support plates 70 and 72 thereby forms another non-parallelogram linkage 138. As the upper side plates 70 move forward, the seat links 74 and 76 will lift the front of the chair seat 20 higher than the back of the seat 20. As a result, the seat 20 tilts back, or reclines. The relative differences in lengths and the distances between the front and rear seat links 74 and 76 govern the angle that the seat 20 reclines.

[0074] The motion of the backrest 22 as the seat 20 moves forward and reclines depends upon the construction of the chair body 12. If the backrest 22 and seat 20 are secured together at a fixed angle, typical of a two-way chair construction, as previously described, forward movement and recline of the seat 20 in the manner just described will likewise cause forward movement and recline of the backrest 22 to generally the same degree. In this construction, the back mounts 98 (if used) are restrained from pivoting by a suitable fastener (not shown) to fix the position of the back mounts 98 on the upper support plates 70. In this construction, the back mounts 98 (if used) are not linked to other components operative during the recline mode.

[0075] In the illustrated embodiment (see Figs. 12 and 13), a three way chair construction is shown. In this construction, the backrest 22 is secured independent of the seat 20 to the back mounts 98 by screws or suitable fasteners 140. In this arrangement, the back mounts 98 are allowed to pivot on pintles 178 on the rear of the upper support plates 70. A pair of backrest links 142 are pivotally coupled by pintles 144 between the back mounts 98 and the rear of the lower support plates 72.

[0076] As Fig. 10 shows, the backrest links 142 and rear seat links 76 are approximately parallel when the upper support plate 70 places the chair seat 20 in the normal seated position. Forward movement of the upper support plates 70 about the links 74 and 76 (carrying

the seat 20 forward while also reclining it) (see Figs. 12 and 13) also pivots the back links 142 forward. The back links 142 exert a pulling force on the back mounts 98, rotating them in a clockwise direction about the pintles 144(as shown by arrow 148 in Fig. 13). The clockwise rotation of the back mounts 98 tilts the backrest 22 rearward relative to the seat 22. This movement of the backrest 22 is independent of the movement of the seat 20 caused by the non-parallelogram linkage 132. Adjusting the relatively lengths of and distances between the back links 142 and the rear seat links 74 governs the degree to which the backrest 22 reclines relative to the seat 20 during the recline mode. If desired, close to a full, bed-like repose can be achieved using a three-way chair construction.

[0077] Governed by the occupant's use of the controller 28, the actuator 40 continues to shorten in the recline mode until a preset fully reclined position is achieved, which is shown in Figs. 9 and 13. At this time, a limit switch on the motor 42 stops further rotation of the lead screw 52. Of course, the occupant can, using the controller 28, stop the motor 42 at any time during the recline mode, and thereby achieve an intermediate degree of recline, such as shown in Fig. 12.

[0078] In the fully reclined position (see Fig. 13), the actuator 40 has shortened to an effective length L3 shorter than effective length L1, as measured between the mounts 58 and 120.

[0079] The above described operation of the mechanized base 14 in the recline mode provides a wall hugger function. In the recline mode (see Figs. 12 and 13), the mechanized base 14 causes the chair seat 20 and backrest 22 to move forward, away from the adjacent wall 18. This assures that, during the recline mode, the top of the backrest 22 stays at essentially the same distance from the adjacent wall 18 in both the normal seated position and the fully reclined position.

[0080] In the illustrated and preferred embodiment (see Figs. 8, 9, 12, and 13), the forward movement of the upper support plates 70 during the recline mode also extends the footrest 26. As shown in Figs. 8 and 9, the footrest 26 is coupled to a conventional lazy tongs linkage 150. The lazy tongs linkage 150 comprises individual links (designated LT1 to LT4) of unequal lengths joined together by pintles 162 in an asymmetrical fashion, according to conventional practice. The most forward links L3 and L4 are pivotally connected by pintles 160 to the upholstered footrest 26. The most rearward links L1 and L2 are pivotally connected by pintles 164 to the upper support plates 70 of the mechanized base 14.

[0081] The top of the innermost link L1 of the lazy tongs linkage 150 is coupled by a pintles 152 to intermediate links 154. The intermediate links 154 are, in turn, coupled by pintles 156 to the middle of the front seat link 74.

[0082] As the upper support plate 70 moves forward during the recline mode (see Figs. 12 and 13, too), the front seat link 74 pivots in a counterclockwise direction (as shown by arrow 158 in Fig. 12). The counterclockwise pivot of the front seat link 74 pulls on the lazy tongs linkage 150, causing it to extend. The lazy tongs linkage 150 also causes the footrest 26 to rotate clockwise (as indicated by the arrow in Figs. 12 and 13), so that the footrest 26 faces upward when the lazy tongs linkage 150 reaches its fully extended position (see Fig. 13). The lazy tongs linkage 150 reaches its fully extended position at the time the actuator reaches its shortest effective length L3, which marks the end of the recline mode.

[0083] As Figs. 9, 12 and 13 show, the lazy tongs linkage 150 includes intermediate brackets 166 secured by pins or suitable fastener 168 to the link L4. An upholstered cross brace 170 is secured across the intermediate brackets 166. As the lazy tongs linkage 150 extends (see Figs. 8 and 12), it lifts the upholstered cross brace 170 into a mutually aligned orientation with the footrest 26. When the footrest 26 is fully extended (see Figs. 9 and 13), the upholstered cross brace 170 provides intermediate support to the occupant's legs.

[0084] With the seat 20 and backrest 22 in the reclined position (or any intermediate reclined position), subsequent operation of the motor 42 to turn the lead screw 52 in a clockwise direction causes the driver 50 to advance forward. The effective length of the actuator 40 increases beyond L3 back toward the length L1 of the transfer position.

[0085] The forward advancing driver 50 transfers a forward pushing force upon the forward thrust bar 118, causing it to rotate in a counterclockwise direction on the thrust rocker arms 114. The pivot of the thrust rocker arms 114 pushes the rear thrust links 124 in a rearward direction, thereby pushing the rearward thrust bar 88 in a rearward direction as well. The rearward pushing force is transferred by the rearward thrust bar 88 to the upper side plates 70. The upper side plates 70 move in a rearward direction. The non-parallelogram linkage lowers the front of the seat 20 as the seat 20 moves rearward. For a three-way chair construction, the back brackets pivot forward (counterclockwise), returning the backrest 22 toward an upright position.

[0086] The rearward movement of the upper side plates 70 also transfers, via the clockwise swinging front seat link 74, a rearward pulling force upon the lazy tongs linkage 150. The lazy tongs linkage 150 retracts, pulling the footrest 26 and upholstered cross brace 170 back toward a retracted position.

[0087] As the lengthening actuator 40 reaches its length L1 (at the transfer point), the footrest 26 and cross brace 170 are fully retracted, and the backrest 22 and the seat 20 are again in the normal seated position.

III. Mechanized Base (Three-Way, Preassembled, Rear Thrust Embodiment)

[0088] Figs. 14 to 16 show another embodiment of a mechanized base 200, which embodies features of

the invention. The mechanized base 200 is, in substantial part, identical to the mechanized base 14 shown in Figs. 4A to 4C. Therefore, common reference numerals will be used, and only significant differences will be discussed.

[0089] As previously described, the chair body 12 carried by the mechanized base 14 was not preassembled. Rather, the seat 20, backrest 22, and side arms 24 comprised component parts, which were assembled as such on the chair frame support unit 34. In Figs. 14 to 16, the chair body 202 comprises a preassembled, conventional reclining chair. The chair body 202 is capable of use without attachment to the mechanized base 200. The chair body 202 can provide a manual reclining action independent of any attachment to the mechanized base 200. Of course, without attachment to the mechanized base 200, the chair body 202 can not provide a lifting function.

[0090] The preassembled chair body 202 is shown in Fig. 14 in a normal seated position. The chair body 202 includes a chair base 224, a seat frame 204, and a backrest frame 206. Side arms 208 are also coupled to the chair base 224 and shown in phantom lines in Fig. 14.

[0091] Fig. 14 shows these components without upholstery for the purpose of illustration. It should be appreciated that the chair body 202 would be fully upholstered in conventional fashion, and would look substantially like the chair body 12 shown in Fig. 1.

[0092] As shown in Fig. 14, the chair body 202 comprises a three-way chair construction. The backrest frame 206 is connected on a pintle 210 for pivoting relative to the seat frame 204. A back link 212 is coupled on a pintle 214 to the backrest frame 206 to recline the backrest frame 206 independent of the seat frame 204, as will be described in greater detail later.

[0093] It should be appreciated that the chair body 202 could comprise a two-way chair construction. In this arrangement, the backrest frame 206 and seat frame 204 would be coupled together at a fixed angle for reclining as a unit.

[0094] As shown in Fig. 14, the chair body 202 also includes an extendable footrest 216. The footrest 216 is coupled to a conventional lazy tongs linkage 218.

[0095] The chair body 202 also includes conventional front and rear seat links 226 and 228 (which are best seen in Fig. 16 and 17). The seat links 226 and 228 pivotally couple the seat frame 204 to the chair base 224. The seat links 226 and 228 are also coupled to the lazy tongs linkage 218 in conventional fashion, to extend the footrest 216 when during recline. A traveling link 220 coupled to the lazy tongs linkage 218 is also coupled to the back link 212.

[0096] The assemblage of seat frame 204, chair base 225, the lazy tongs linkage 218, seat links 226 and 228, backrest frame 206 and associated back link 212 shown in Fig. 14, can be purchased preassembled, e.g., from Leggett and Platt Incorporated., which incorporates the assemblage as part of its WALLHUGGER ® IMPERIAL™ line of recliners.

[0097] The entire preassembled chair body 202 -- comprising the seat 204, backrest 206, footrest 216, and associated linkage 212, 218, and 220 -- is mounted as a unit on the mechanized base 200. Fig. 17 shows the base 200 before mounting of the chair body 202. The base 200 shown in Fig. 17 differs from the base 14 shown in Fig. 4C, in that the chair frame support unit 34 does not include an upper support plate 70 and the associated front and rear seat links 74 and 76, lazy tongs linkage 150, back mounts 98, and back links 142. This is because the preassembled chair body 202 already carries equivalent components; namely, the seat frame 204, seat links 226 and 228, lazy tongs linkage 218, backrest frame 206, and back link 212, respectively.

[0098] The chair base 224 is bolted or otherwise secured with fasteners 230 to the flange 94 to the lower support plates 72, as Fig. 14 best shows. As Fig. 14 also shows, the rear thrust bar 88 is secured by a bracket 234 and fasteners 232 to the seat frame 204.

[0099] The mechanized base 200 operates in the lift and recline modes in the same manner as previously described. The actuator 40 has an initial transfer length L1 when the chair body 202 is in the normal seated position, shown in Fig. 14. In the lift mode, lengthening of the actuator 40 beyond the transfer length L1 to fully extended length L2 lifts the tilts the seat frame 204 forward on the lift arms 62 and 110, in exactly the same manner previously described in connection with Figs. 6, 7, and 11. In the recline mode, shortening of the actuator 40 from the transfer length L1 to a fully retracted length L2 (see Fig. 16) tilts the seat frame 202 rearward, while also tilting the backrest frame 206 rearward.

[0100] Figs. 15 and 16 provide further details of the operation of the mechanized base 200 in the recline mode. As Fig. 15 shows, shortening of the actuator 40 from its transfer length L1 pulls rearward on the forward thrust bar 118, causing the thrust rocker arms 114 to rotate about the pinties 116 in a clockwise direction (as shown by the arrow 182 in Fig. 15). The clockwise pivot of the thrust rocker arms 114 about the pintles 116, pulls the rear thrust links 124 forward. This force, in turn, pulls the rearward thrust bar 88 forward. The forward pulling force is transferred to the seat frame 204. The seat frame 204 and backrest frame 206 move forward. The side arms 208 (coupled with chair base 224 to the flange 94 of the lower support plates 72) remain stationary.

[0101] As Figs. 15 and 16 also show, the front seat links 226 are longer than the rear seat links 228 and, with the seat frame 204 and chair base 224, form a non-parallelogram linkage 138. As the seat frame 204 moves forward, the seat links 226 and 228 lift the front of the seat frame 204 higher than the back of the seat frame 204. As a result, the seat frame 204 tilts back, or reclines. The relative differences in lengths and the dis-

tances between the front and rear seat links 226 and 228 govern the angle that the seat 20 reclines.

[0102] As the seat frame 204 moves forward during the recline mode, the counterclockwise pivot of the front seat link 226 pulls on the lazy tongs linkage 218 (via intermediate links 236), causing it to extend. The extending lazy tongs linkage 218 rotates the footrest frame 216 clockwise to face upward when the lazy tongs linkage 218 reaches its fully extended position (see Fig. 16). The lazy tongs linkage 218 reaches its fully extended position at the time the actuator reaches its shortest effective length L3, which marks the end of the recline mode.

[0103] As Figs. 14 to 16 show, the lazy tongs linkage 218 carries a cross brace 238, which provides intermediate support to the occupant's legs in the manner previously described.

[0104] If the backrest frame 206 and seat frame 204 are secured together at a fixed angle (i.e., a typical two-way chair construction), forward movement and recline of the seat frame 204 will likewise cause forward movement and recline of the backrest frame 206 to generally the same degree.

[0105] In the three way chair construction shown, the traveling link 220 (coupled to the lazy tongs linkage 218) pulls on the back link 212 as the lazy tongs linkage 218 fully extends (see Fig. 16). In response, the back link 212 pivots clockwise in response, tilting the backrest frame 206 rearward.

[0106] The above described operation of the mechanized base 200 in the recline mode provides a wall hugger function. In the recline mode (see Figs. 15 and 16), the mechanized base 200 causes the seat frame 204 and backrest frame 206 to move forward, away from the adjacent wall 18. This assures that, during the recline mode, the top of the backrest frame 206 stays at essentially the same distance from the adjacent wall 18 in both the normal seated position (Fig. 14) and the fully reclined position (Fig. 16).

IV. The Mechanized Base (Three-Way, Base-Assembled, Forward Thrust Embodiment)

[0107] Details of another embodiment of a mechanized base 314 (see Fig. 18) that provides a wall hugger function will now be discussed.

[0108] In many respects, the mechanized base 314 shares many structural components that are the same as the mechanized base 14 shown in Figs. 4A, 4B, and 4C. To begin with, the mechanized base 314 includes a bottom base unit 332 and a chair frame support unit 334 joined by the five bolts B1, B2, B3, B4, and B5 (in generally the same manner earlier shown in Fig. 4C).

[0109] In the embodiment shown in Fig. 18, it is contemplated that, the components of the chair itself (i.e., the seat 320, side arms 324, and backrest 322, as shown in phantom lines in Fig. 21, but which are not shown in Fig. 18 to simplify the illustration) will be assembled on the chair frame base unit 334 as individual component parts, and are not preassembled into a chair body before their attachment to the support unit 334.

[0110] However, a chair frame base unit of the type shown in Fig. 18 can readily accept the mounting of a preassembled chair body, as will be described later with reference to Fig. 26.

A. The Bottom Base Unit

[0111] Referring to Figs. 18 to 20, the bottom base unit 332 includes a base frame 336. A back brace 338 is welded or otherwise fastened across the rear of the base frame 336 to provide strength and stability.

[0112] The back brace 338 carries a single actuator 340. In the illustrated embodiment, the actuator 340 comprises a single electric motor 342 driving a single extendable driver 350. The controller 328 (previously described) is coupled by a cable 346 to the motor 342. A power cable 348 couples the motor 342 to a conventional electrical power outlet.

[0113] The driver 350 can be driven by a conventional, rotating lead screw. Other power-actuated mechanisms can be used, e.g., a hydraulic or a pneumatic ram.

[0114] In the illustrated embodiment, the driver 350 is coupled to the motor 342 by a right angle speed reducer 354. The driver 350 includes a drive nut, which threadably engages the lead screw. The actuator 340 is pivotally connected on a pintle 356 to an actuator mount 358, which is welded or otherwise fastened to the back brace 338.

[0115] As also explained before, operation of the control buttons 330 on the controller 328 command the motor to cause clockwise or counterclockwise rotation of the lead screw. When the motor 342 rotates in a first direction (e.g., clockwise), the driver 350 advances in a first direction, which in the illustrated embodiment is away from the motor 342. For point of reference, this direction will be called the forward or fore direction.

[0116] Conversely, when the motor 342 rotates in a second direction (e.g., counterclockwise), the driver 350 retracts in a second direction, which in the illustrated embodiment is toward the motor 342. For point of reference, this direction will be called the rearward or aft direction.

[0117] The bottom base unit 332 also carries a forward pair of lift arms 362. The forward lift arms 362 are pivotally connected on pintles to the bottom base unit 332 by a front brace 364.

[0118] The bottom base unit 332 also includes a pair of rear lift arm mounts 368. The rear lift arm mounts 368 are welded or otherwise secured to the back brace 338.

B. The Chair Frame Support Unit

[0119] The chair frame support unit 334 includes a pair of upper and lower side plates, respectively 370 and 372. The upper side plates 370 are coupled to the lower side plates 372 by spaced apart front and rear seat links, respectively 374 and 376. The seat links 374 and 376 are pivotally connected on pintles at their opposite ends to the upper and lower side plates 370 and 372. The upper support plates 370 swing on the lower support plates 372 in fore and aft directions on the front and rear seat links 374 and 376.

[0120] A front spanning brace 380 is coupled by fasteners or welding across the front of the upper support plates 370 to provide structural strength and stability. A rear spanning brace 388 provides a similar function at the rear of the upper support plates 370.

[0121] Flanges 392 on the upper support plates 370 are secured by suitable fasteners 390 to the seat 320 of the chair frame 312 (as Fig. 21 shows). The side arms 324 are secured by suitable fasteners 396 to the lower support plates 372 (as Fig. 21 also shows).

[0122] If a two-way chair construction is desired, the backrest 322 is secured directly to the chair seat 320 on the upper support plates 370 (see Fig. 21) by a conventional bracket (not shown). Alternatively, or in combination with a direct seat-to-backrest connection, a pair of fixed (i.e., not pivotable) back mounts carried on rear of the upper support plates 370 can be provided (like those identified by reference numeral 398 in Fig. 21, only secured in a not pivoting fashion). The backrest 322 can be attached by suitable fasteners (not shown) to the fixed back mounts.

[0123] If a three-way chair construction is desired (as Fig. 21 shows), a pair of pivoting back mounts 398 can be pivotally connected on pintles at the rear of the upper support plates 370 and connected by back links 442 to cause pivoting of the backrest 322 relative to the seat 320.

[0124] A forward thrust bar 407 is welded or otherwise fastened across a pair of thrust links 409, which are pivotally connected by pintles or bolts to the upper support plates 370 and the lower support plates 372. Fig. 20 shows an unobstructed view of the forward thrust bar 407 and thrust links 409.

[0125] A pair of rearward lift arms 410 are pivotally connected on pintles to thrust brackets 412, which welded or otherwise fastened to a lift bar 404. A lift arm brace 408 9 (shown in Fig. 18) can be welded or otherwise fastened across the rearward lift arms 410 to provide added structural strength and stability.

[0126] The pair of rearward lift arms 410 are pivotally coupled at their other ends by the two bolts B1 and B2 to the rear pair of lift arm mounts 368 on the bottom base unit 332. In like manner, the free ends of the forward pair of lift arms 362 are pivotally coupled by the two bolts B3 and B4 to the front of the lower support plates 372. These four bolts B1, B2, B3, and B4 conveniently couple the chair frame support unit 334 to the bottom base unit 332.

[0127] The lift bar 404 also carries a pair of thrust brackets 412, which are also shown in an unobstructed view in Fig. 20. The thrust brackets 412 are welded or otherwise secured at equally spaced distances from the middle of the lift bar 404.

[0128] A pair of thrust rocker arms 414 are pivotally connected by pintles to the thrust brackets 412. The thrust rocker arms 414 can rotate clockwise and counterclockwise about the pintles , unless otherwise restrained, as will be described in greater detail later.

[0129] A thrust bar 418 is coupled by welding or suitable fastening to the front of the thrust rocker arms 414, for movement on the rocker arms 414 about the pintles. The thrust bar 418 carries a front actuator mount 420, which is welded or otherwise secured to it.

[0130] The free end of the driver 350 of the actuator 340 is pivotally connected by the bolt B5 to the front actuator mount 420. The bolt B5 operatively couples the chair frame support unit 334 to the single actuator 340.

[0131] The forward thrust bar 407 (previously described) is pivotally connected by pintles to the ends of a pair of forward thrust links 424. The opposite ends of the forward thrust links 424 are connected on pintles to the lower portion of the thrust rocker arms 414.

[0132] The forward thrust links 424 operatively couple the forward thrust bar 407 (through the pivotally connected thrust rocker arms 414, the thrust bar 418, and the mount 420) to the single actuator 340. The thrust rocker arms 414 (and, with it, the forward thrust bar 418) are coupled to the upper and lower support plates 370 and 372 by the forward thrust bar 407 and the forward thrust links 409.

C. Operation of the Mechanized Base

[0133] The foregoing connections between the components of the bottom base unit 332 and the chair frame support unit 334 make possible the realization of both lift and recline modes using the single actuator 340, while also providing the wall-hugger feature.

i. Normal Seating Position

[0134] Figs. 18 and 21 show the orientation of principal operating components of the bottom base unit 332 and the chair frame support unit 334 when the chair body (shown in phantom lines in Fig. 21) is in its normal seated position. This position generally corresponds with the orientation of the chair body 12 in Fig. 1.

[0135] In this condition (see Fig. 21), the lift bar 404 rests on the base frame 336. The forward and rearward lift arms 362 and 410 also rest generally parallel to and on the base frame 336.

[0136] Also, in this position, the actuator 340 has an effective neutral length L1, as measured between the rear mount 358 and the forward mount 420. The posi-

tion of the actuator 340 when in this length L1, previously called the transfer position, constitutes the transition between the lift mode and the recline mode.

ii. Lift Mode

[0137] Figs. 21 to 23 show sequential operation of the mechanized base 314 in the lift mode. The lift mode begins with the actuator 340 in the transfer position shown in Fig. 21.

[0138] The motor 342 turns the lead screw in a first direction (e.g., clockwise) to advance the driver 350 in the first (forward) direction, as Fig. 22 shows. The length of the actuator 340 increases beyond L1, applying a force F_{LIFT} to the mount 420. The lift mode commences.

[0139] The forward force F_{LIFT} is applied directly to the forward thrust bar 418. In the transfer position shown in Fig. 21, pivotal motion of the thrust rocker arms 414 in a counterclockwise direction is restrained, because the thrust rocker arms 414 are effectively locked to the upper and lower support plates 370 and 372 by the forward thrust bar 407 and forward thrust links 409. As a consequence, the force F_{LIFT} created by the extending actuator 340 pivots the actuator 340 in a clockwise direction about its mount 358, as Figs. 22 and 23 show. The clockwise pivot is transferred by the thrust bar 418 to the lift bar 404, which also pivots on the forward and rearward lift arms 362 and 410 in a clockwise direction about the mounts 368 in synchrony with the actuator 340.

[0140] As Figs. 22 and 23 show, as the actuator 340 progressively increases in length and pivots clockwise on the base frame 336, the lower support plate 372, and, with it, the upper support plate 370, are lifted in tandem by the lift bar 404. The upper and lower support plates 370 and 372 pivot on the forward and rearward lift arms 362 and 410. As Figs. 22 and 23 show, the entire chair body support unit 334, and with it, the chair body itself, is elevated above the base frame unit 332.

[0141] As before described, the assemblage of the shorter forward lift arms 362 and longer rearward lift arms 410 to the base frame 336 and the lower support plates 372 creates a non-parallelogram linkage. The non-parallelogram linkage causes the upper and lower support plates 370 and 372 to tilt forward toward the floor as they are elevated, tilting the chair seat 320 forward to the same extent.

[0142] When a preset fully elevated position is achieved (which is shown in Fig. 23), a limit switch on the motor 342 stops further clockwise advancement of the driver 350.

[0143] In this fully lifted position, the actuator 340 has an new effective length L2, as measured between the mounts 368 and 420. The new length L2 is longer than neutral length L1 of the actuator 40 when in the transfer position.

[0144] Subsequent operation of the motor 342 to turn the lead screw counterclockwise causes the driver 350 to travel in a second direction, which has been called a rearward direction, along the lead screw 372. The effective length of the actuator 40 decreases from L2 back toward L1.

[0145] The rearward travel of driver 350 transfers a force F_{LOWER} to the mount 420. The force F_{LOWER} created by the shortening actuator 340 pivots the actuator 340 in a counterclockwise direction about its mount 358. The counterclockwise pivot force is transferred by the thrust bar 418 to the lift bar 404, which also pivots on the rearward lift arms in a counterclockwise direction about the mounts 368 in synchrony with the actuator 340.

[0146] As the actuator 340 shortens in length from L2 toward L1 and pivots counterclockwise on the base frame 336, the lower support plate 372, and, with it, the upper support plate 370, are lowered in tandem by the lift bar 404, pivoting on the forward and rearward lift arms 362 and 410. The entire chair body support unit, and, with it, the chair body 12 itself, descend toward the base frame unit.

[0147] During the descent, the forward and rearward lift arms 362 and 410 tilt the seat 20 rearward as the chair body 312 returns to its normal seated position. At this point, the actuator has resumed its original effective length L1, and is again at its transfer position.

iii. Recline Mode

[0148] Figs. 18 to 20 show sequential operation of the mechanized base 314 in the recline mode.

[0149] The recline mode begins, with the actuator 340 in the transfer position, and the chair body in a normal seating position.

[0150] The motor 342 is commanded to turn the lead screw in a second direction (i.e., a direction different than the direction of the lift mode, which is clockwise in the illustrated embodiment). The driver 350 travels in the second (rearward) direction. The length of the actuator 320 shortens from L2, applying a pulling force $F_{RECLINE}$ to the mount 420. The recline mode commences.

[0151] The pulling force $F_{RECLINE}$ is applied directly to the thrust bar 418. In the transfer position shown in Fig. 18, pivotal motion of the thrust rocker arms 414 in a clockwise direction is not restrained. Thus, rearward travel of the driver 350 past the transfer position pulls rearward on the thrust bar 418, causing the thrust rocker arms 414 to rotate about the pintles in a clockwise direction.

[0152] As Figs. 19 and 20 show, as the actuator 340 progressively shortens, the clockwise pivot of the thrust rocker arms 314 about the pintles pushes the forward thrust links 424 forward. This forward force, in turn, pushes the thrust bar 407 forward. The forward pushing force is transferred by the forward thrust links 409 to the upper support plates 370, which are advanced forward on the front and rear links 374 and 376, accordingly. The lower side plates 372 remain stationary, as the forward travel of the upper support links 370, created by

the forward pushing force on the thrust bar 407, proceeds. The chair seat (not shown) carried by the upper support plates 370 will thereby move forward, while the side arms (not shown)coupled to the lower support plates 372 remain stationary.

[0153] As Figs. 19 and 20 also show, the front seat links 374 are longer than the rear seat links 376. The assemblage of the front and rear seat links 374 and 376 to the upper and lower support plates 370 and 372 thereby forms another non-parallelogram linkage. As the upper side plates 370 move forward, the seat links 374 and 376 will lift the front of the chair seat higher than the back of the seat. As a result, the seat tilts back, or reclines. The relative differences in lengths and the distances between the front and rear seat links 374 and 376 govern the angle that the seat reclines.

[0154] The motion of the backrest as the seat moves forward and reclines depends upon the construction of the chair body 312. If the backrest and seat are secured together at a fixed angle, typical of a two-way chair construction, as previously described, forward movement and recline of the seat in the manner just described will likewise cause forward movement and recline of the backrest to generally the same degree. In this construction, the back mounts 398 (if used) are restrained from pivoting by a suitable fastener (not shown) to fix the position of the back mounts 398 on the upper support plates 370. In this construction, the back mounts 398 (if used) are not linked to other components operative during the recline mode.

[0155] In the three way chair construction shown in the illustrated embodiment, the backrest is secured independent of the seat to the back mounts 398 by screws or suitable fasteners. In this arrangement, the back mounts 398 are allowed to pivot on pintles on the rear of the upper support plates 370. A pair of backrest links 442 are pivotally coupled by pintles between the back mounts 398 and the rear of the lower support plates 372. The details of the three way reclining action are as previously described in connection with the embodiment shown in Figs. 10, 12, and 13.

[0156] Governed by the occupant's use of the controller 328, the actuator 340 continues to shorten in the recline mode until a preset fully reclined position is achieved, which is shown in Fig. 20. At this time, a limit switch on the motor 342 stops further retraction of the driver 350. Of course, the occupant can, using the controller 328, stop the motor 342 at any time during the recline mode, and thereby achieve an intermediate degree of recline, such as shown in Fig. 19.

[0157] In the fully reclined position, the actuator 340 has shortened to an effective length L3 shorter than effective length L1, as measured between the mounts 358 and 420.

[0158] The above described operation of the mechanized base 314 in the recline mode provides a wall hugger function. In the recline mode (see Figs. 19 and 20), the mechanized base 314 causes the chair seat and backrest to move forward, away from the adjacent wall. This assures that, during the recline mode, the top of the backrest stays at essentially the same distance from the adjacent wall 18 in both the normal seated position and the fully reclined position.

[0159] In the illustrated and preferred embodiment, the forward movement of the upper support plates 370 during the recline mode also exerts, through the thrust links 409, a forward force upon the lazy tong linkage 450 of the footrest 326. The lazy tongs linkage 450 extends. Further details of the extension of the lazy tongs linkage 450 are as previously described in connection with the embodiment shown in Figs. 12 and 13.

[0160] With the seat and backrest in the reclined position (or any intermediate reclined position), subsequent operation of the motor 342 to turn the lead screw in a clockwise direction causes the driver 350 to advance forward. The effective length of the actuator 340 increases beyond L3 back toward the length L1 of the transfer position.

[0161] The forward advancing driver 350 transfers a forward pushing force upon the thrust bar 418, causing it to rotate in a counterclockwise direction. The pivot of the thrust rocker arms 414 resulting from a forward pushing force on the thrust bar 418 pulls the thrust bar 407 in a rearward direction. The rearward pulling force is transferred to the upper side plates 370 by the thrust links 409. The upper side plates 370 move in a rearward direction. The non-parallelogram linkage lowers the front of the chair seat as the seat moves rearward. For a three-way chair construction, the back brackets pivot forward (counterclockwise), returning the backrest toward an upright position.

[0162] The rearward movement of the upper side plates 370 also transfers, via the thrust links 409, a rearward pulling force upon the lazy tongs linkage 450. The lazy tongs linkage 450 retracts, pulling the footrest 326 back toward a retracted position.

iv. Lazy Tongs Linkage Lock During Lift Mode

[0163] As the seat tilts forward at the upper end of the lift mode (see Fig. 23), the weight of the occupant may cause the upper side plates 370 to shift forward. The forward shift of the side plates 370 during the lift mode may, in turn, exert through the thrust links 409, a forward force upon the lazy tong linkage 450 of the footrest 326. The lazy tongs linkage 450 could unexpectedly extend during the lift mode, causing the occupant to slide out of the chair.

[0164] In the illustrated embodiment, the mechanical base 314 includes a locking mechanism 500. The locking mechanism 500 interferes with the lazy tongs linkage 450 when the base 314 is operating in the lift mode, to resist opening of the lazy tongs linkage 450 in response to a forward force imposed by the thrust links 409.

[0165] The locking mechanism 500 can be vari-

ously constructed. In the illustrated embodiment, the locking mechanism includes an appendage 502 on each of the front lift arms 362. As illustrated, the appendage 502 takes the form of an L-shaped finger that projects from the end of each front lift arm 362 outwardly of and slightly beyond the associated lower side panel 372(see Fig. 18). Other configurations could be used.

[0166] As Figs. 21 and 22 show, as each lift arm 362 pivots during the lift mode, the associated appendage 502 also pivots successively toward contact with the lazy tongs linkage 450. Figs. 24 and 25 show the successive pivoting of the appendage 502 toward the lazy tongs linkage 450 as the lift arm 362 pivots.

[0167] As the frame support unit 334 reaches or nears its fully elevated position (as Figs. 23 and 25 show), the appendage 502 is brought into contact with the lazy tongs linkage 450, or at least in an adjacent interfering relationship laying in the extension travel path of the linkage 450. The lift arm 362 holds the appendage 502 in interference with the lazy tongs linkage 40 when the frame support unit 334 is fully elevated. The interference prevents extension of the lazy tongs linkage 450. The appendage 502 effectively locks the lazy tongs linkage in its fully retracted, closed condition.

[0168] Movement of the frame support unit 334 back toward the normal seated position pivots the appendage 502 out of interference with the lazy tongs linkage 450 (see Figs. 21 and 22). The lazy tongs linkage 450 is thereby freed to open, as desired, in response to a forward force imposed by the thrust links 409 when the base 314 is operated in the recline mode.

V. The Mechanized Base (Three-Way, Pre-Assembled, Forward Thrust Embodiment, With Lazy Tongs Linkage Lock)

[0169] The assemblage of chair body including the seat 320, side arms 324, chair back 322 (see Fig. 21), along with the associated side plates 370 and 372, with the reclining linkage (e.g., the reclining links 374 and 378), and the lazy tongs linkage 450 can be purchased preassembled, e.g., the ZERO-WALL™ line of recliners made by Hickory Springs Manufacturing Company (Hickory, North Carolina) or a similar style recliner.

[0170] The entire preassembled chair body can be mounted as a unit on a mechanized base 532, as shown in Fig. 26. Fig. 26 shows the base 532 before mounting of the chair body. The base 532 shown in Fig. 26 includes the thrust bar 418, which is linked to the thrust bar 407 via the rocker arms 414 and thrust links 424. The base 532 also includes the actuator 340 coupled to the mount 420 to move the thrust bar 418, and thereby move the thrust bar 407. The base 532 also includes the front and rear lift arms 362 and 410.

[0171] The base 532 shown in Fig. 26 does not include upper and lower support plates 370 and 372, and the associated front and rear seat links 374 and 376, lazy tongs linkage 450, back mounts 398, and back links 442, because the preassembled chair body already carries equivalent components.

[0172] The chair body is bolted or otherwise secured with fasteners directly to the side flanges 534 of the base 532, to which the front lift arms 362 are pivotally attached. The thrust bar 407 of the chair base 532 is suitably coupled to the reclining linkage of the preassembled chair. The preassembled chair will typically include its own front brace, which is removed to accommodate attachment of the thrust bar 407 of the base 532. The rear lift arms 410 are also attached to the frame of the preassembled chair or to its reclining linkage to provide, together with the front arms 362, the lift function.

[0173] With the preassembled chair attached, the mechanized base 534 operates in the lift and recline modes in the same manner as previously described.

[0174] It should be appreciation that variations to the described structures can be made while keeping many of the important features of the invention.

VI. The Mechanized Base (Three-Way, Pre-Assembled, Forward Thrust Embodiment, with Dynamic Lazy Tongs Linkage Locking)

[0175] Figs. 27 to 29 show yet another embodiment of a mechanized base 600. Figs. 27 to 29 show the base 600 before mounting of a chair body and associated reclining and lazy tong mechanisms. To better expose the component parts to view, Fig. 27 shows the base 600 in the position in which the chair body is lifted. Fig. 28 shows the base 600 in the position in which the chair body is in a normal seated condition. Fig. 29 shows the base 600 in the position in which the chair body is in a reclined condition.

[0176] The base 600 includes a base frame 602. Side plates 604 and 606 are coupled to the base frame 602 by forward and rearward lift arms 608 and 610, as previously described. Fig. 27 shows the side plates 604 and 606 elevated and tilted forward by the lift arms 608 and 610. Fig. 28 shows the side plates 604 and 606 in the normal seated condition.

[0177] The base 600 can be fabricated to include chair body components, such upper and lower support plates 370 and 372, and the associated front and rear seat links 374 and 376, lazy tongs linkage 450, back mounts 398, and back links 442 (as shown, e.g., in Fig. 18). Alternatively, an entire preassembled chair body can be mounted as a unit on a mechanized base frame 602. For this reason, the base 600 is shown not include reclining components of the chair body, because the preassembled chair body already carries equivalent components. The assemblage of an entire chair body including the seat 320, side arms 324, chair back 322, along with the associated side plates 370 and 372, with the reclining linkage (e.g., the reclining links 374 and

376), and the lazy tongs linkage 450 can be purchased preassembled, e.g., the ZERO-WALL™ line of recliners made by Hickory Springs Manufacturing Company (Hickory, North Carolina) or a similar style recliner.

[0178] To assemble the chair body to the base 600, the reclining links of the chair body are attached to the side plates 604 and 606 of the base 600, in the same manner that the links 374 and 376 are coupled to the plates 372 in Figs. 18 and 21.

[0179] The base 600 includes a rear thrust bar 612, which is linked to a forward thrust bar 614 via the thrust links 616 and a swinging link 618. The swinging link 618 is pivotally connected to a support bracket 630 by a pin 620 (shown in Figs. 28 and 29). The thrust bar 614 of the chair base 600 is suitably coupled to the reclining linkage of the preassembled chair, as previously described in the context of Fig. 26.

[0180] The base 600 also includes an actuator mount 622 which is pivotally coupled to the motor end of the actuator 624, which is shown in phantom lines in Figs. 28 and 29. The extendable driver 626 of the actuator 624 is pivotally coupled by a pin 628 to the swinging link 618. As Figs. 28 and 29, the actuator pivot pin 628 is spaced away from the swinging link pivot pin 620, about which the swinging link 618 rotates.

[0181] Fig. 28 shows the swinging link 618 in a transfer position, in which the chair body is in a normal seated condition. As Fig. 29 shows, retraction of the driver 626 when the swinging link 618 is in the transfer position swings the link 618 in a clockwise direction (as indicated by the arrow in Fig. 29). The pin 628, which pivotally couples the actuator 624 to the swinging link 618, travels in an arcuate path below the pin 620, about which the swinging link 618 pivots. Clockwise rotation of the swinging link 618 imparts forward linear movement to the thrust bar 614, through the thrust bar 612 and links 616.

[0182] The application of force by the actuator driver 626 below the rotational axis of the swinging link 618 results in a smooth, uninterrupted transfer of forward force from the actuator driver 626 to the thrust bar 614. Forward movement of the trust bar 614 advances the chair seat forward. As previously described (and as shown in Figs. 19 and 20), as the chair seat moves forward, the reclining links 374 and 376 recline the chair back in a wall-hugging motion. This, in turn, actuates the lazy tongs linkage 450, causing the footrest 326 to extend.

[0183] Conversely, with the chair back reclined, subsequent extension of the driver 626 swings the link 618 in a counterclockwise direction, until the link 618 again assumes the transfer position shown in Fig. 28. The thrust bar 614 moves rearward, pulling the chair seat rearwardly with it. As previously described (and as shown in Figs. 19 and 20), as the chair seat moves rearward, the reclining links 374 and 376 return the chair back to its normal seated condition. This, in turn, actuates the lazy tongs linkage 450, causing the footrest 326 to retract.

[0184] The application of force by the actuator driver 626 below the rotational axis of the swinging link 618 results in a smooth, uninterrupted transfer of rearward force from the actuator driver 626 to the thrust bar 614.

[0185] When the swinging link 618 is in the transfer position shown in Fig. 28, further rotation in a counterclockwise direction is resisted. Further extension of the driver 626 therefore applies a lifting force to the lift bar 632, which is coupled to the chair support bracket 630. As previously described (and as shown in Figs. 21 to 23), the lifting force elevates the chair body (as Fig. 27 shows).

[0186] The lifting force applied by the actuator driver 626 through the swinging link 618 applies a counter force to the reclining mechanism of the chair. The counter force locks the reclining mechanism in the normal seated condition as the chair body is lifted. Because the actuator 624 is coupled to the swinging link 618 below the pivot point of the swinging link 618 (i.e., below the pin 620), the moment arm between the actuator and the swinging link pivot point will increase as the chair body is lifted. The magnitude of the counter force applied through the swinging link 618 to the reclining mechanism thereby increases as the chair body is lifted. This dynamic counter force, which is applied to the reclining mechanism via the swinging link 618 during lifting, resists actuation of the lazy tongs linkage 450 during the lifting mode.

[0187] Subsequent retraction of the driver 626 applies a lowering force to the lift bar 632. As previously described (and as shown in Figs. 21 to 23), the lowering force returns the chair body to a normal seated condition, at which the swinging link 618 assumes its transfer position (shown in Fig. 28).

[0188] The features of the invention are set forth in the following claims.

Claims

1. In a reclining chair having a backrest, a seat including a front seat portion, and a base, the improvement comprising:

   an actuator on the base, and

   a reclining linkage assembly coupled to the actuator and including a forward thrust bar on the base adapted to be coupled to the front portion of the seat, the reclining linkage assembly being operable, in response to operation of the actuator, for applying a pushing force to the forward thrust bar to advance the seat and backrest forward while tilting the backrest rearward from a generally upright position to a generally reclined position, whereby distance between the backrest and an adjacent wall remains generally constant when the backrest is in the gen-

erally upright position and in the generally reclined position.

2. In a reclining chair having a backrest, a seat including a front seat portion, and a base, the improvement comprising:

an actuator on the base operable in a first mode and in a second mode,
a lifting linkage assembly on the base coupled to the seat and the actuator and being operable, when the actuator operates in the first mode, for lifting the seat and tilting the seat forward to assist exit from the chair, and
a reclining linkage assembly coupled to the actuator and including a forward thrust bar on the base coupled to the front portion of the seat, the reclining linkage assembly being operable, when the actuator operates in the second mode, for applying a pushing force on the forward thrust bar to push the seat and backrest forward while tilting the backrest rearward from a generally upright position to a generally reclined position, whereby distance between the backrest and an adjacent wall remains generally constant when the backrest is in the generally upright position and in the generally reclined position.

FIG. 1

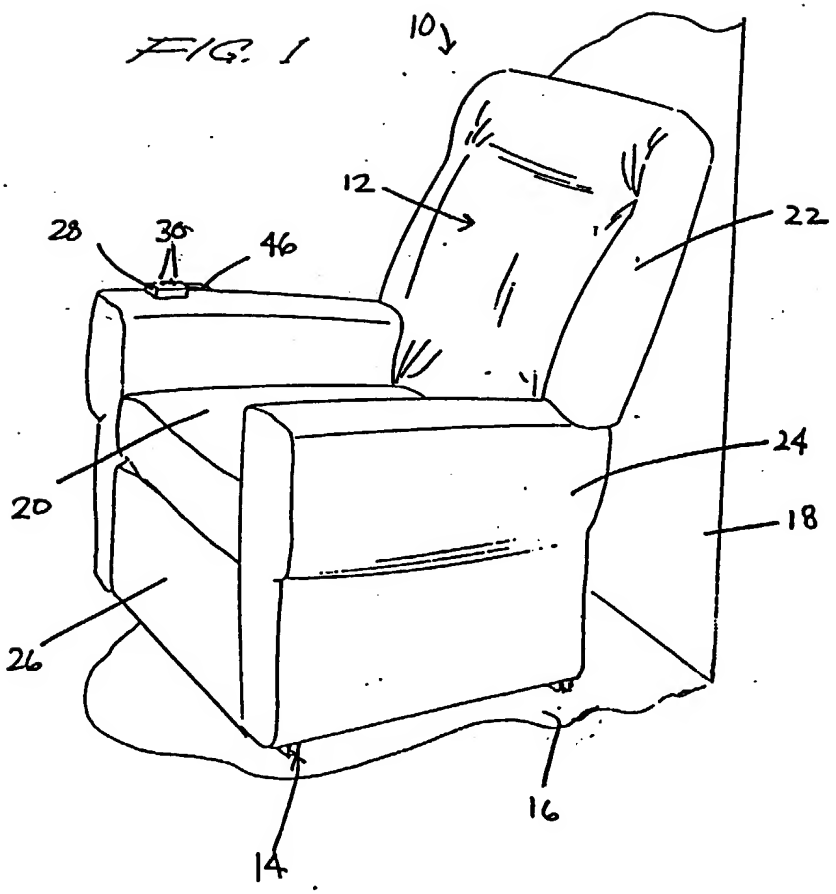
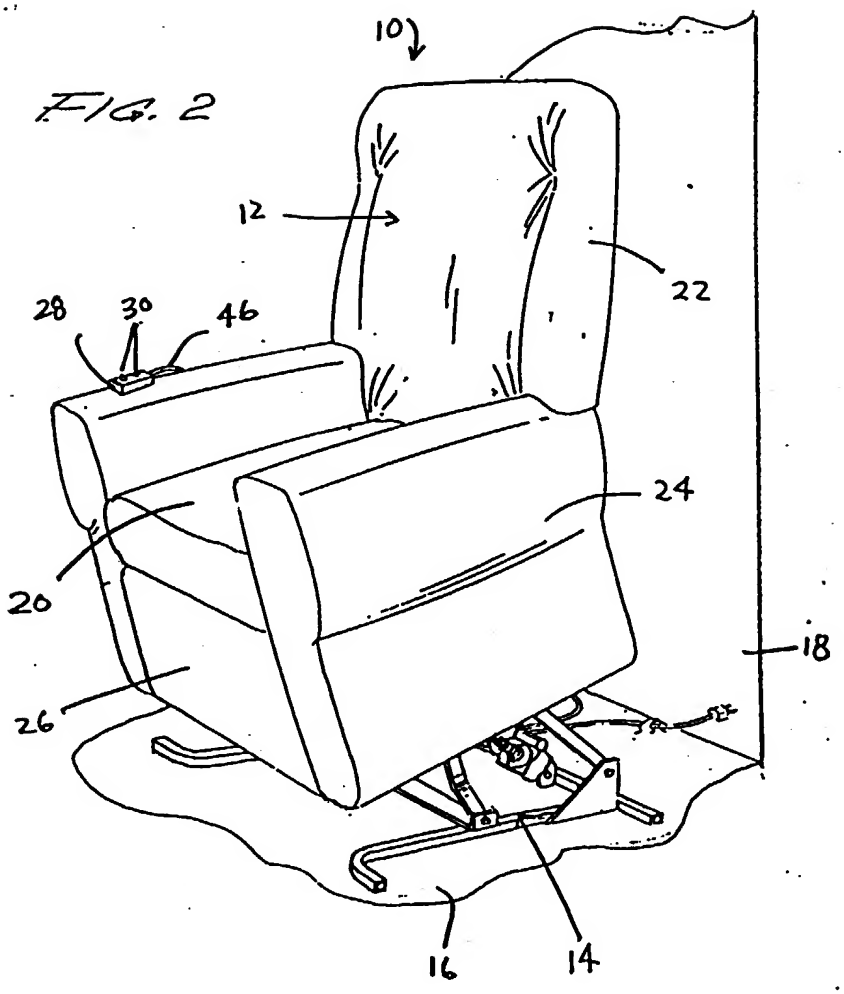


FIG. 2



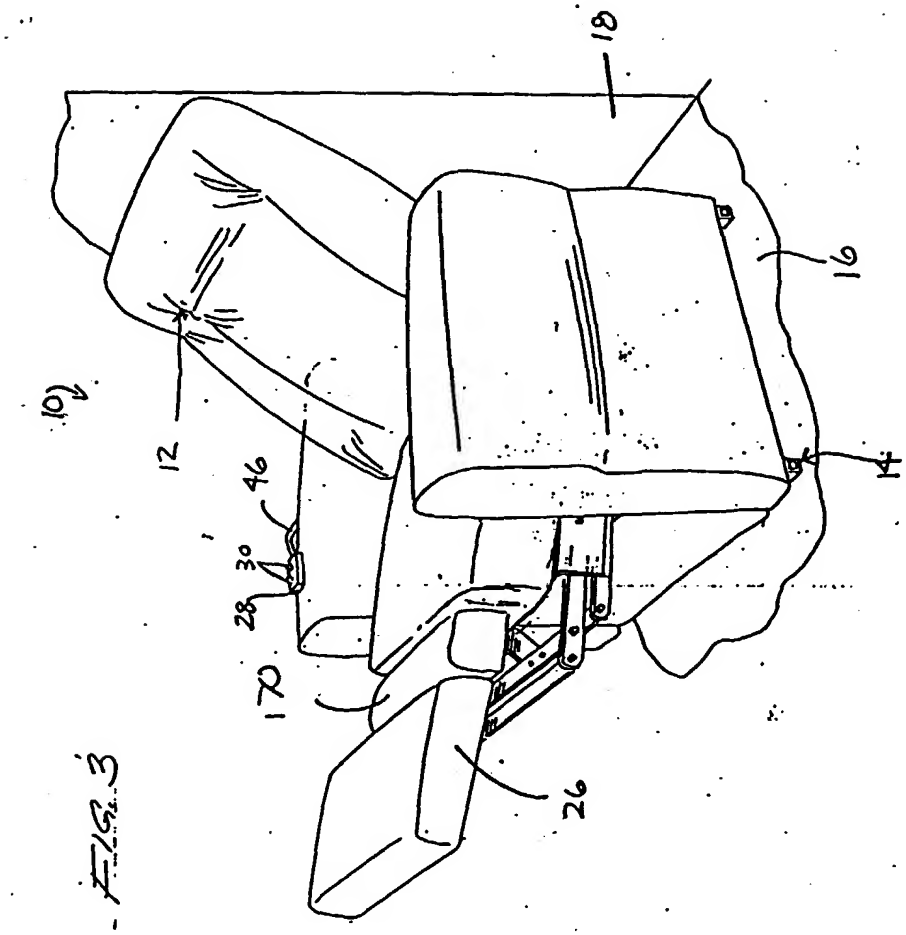


FIG. 3

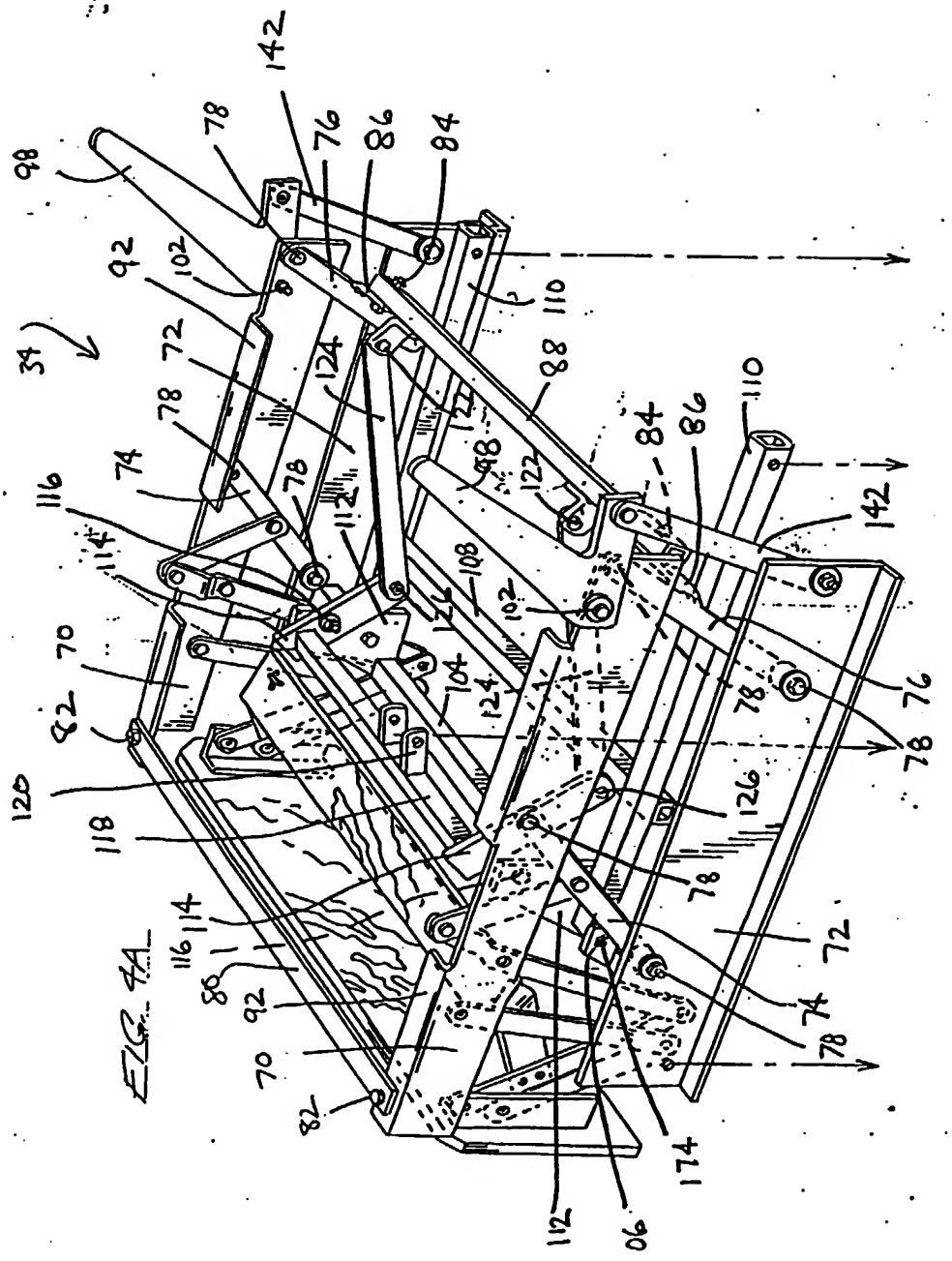

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FIG. 4A

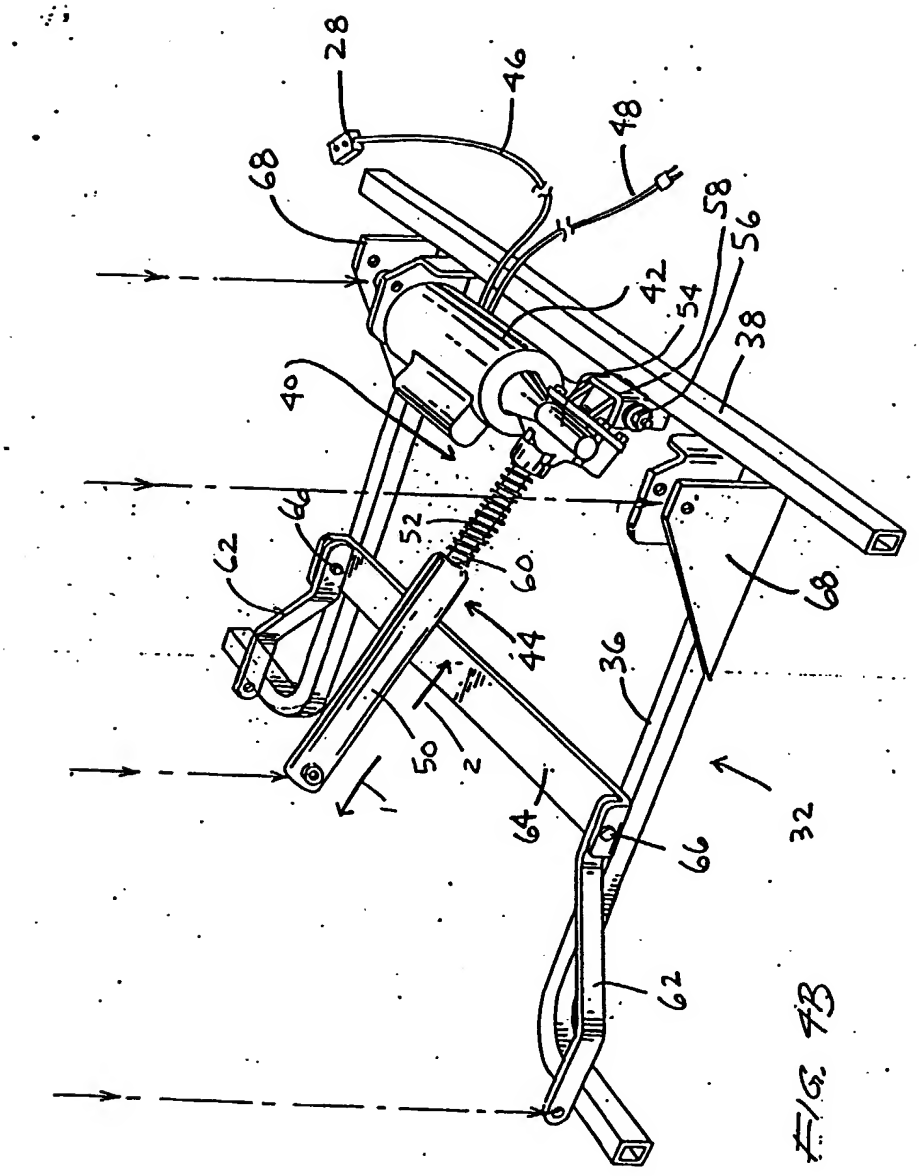

FIG. 4B

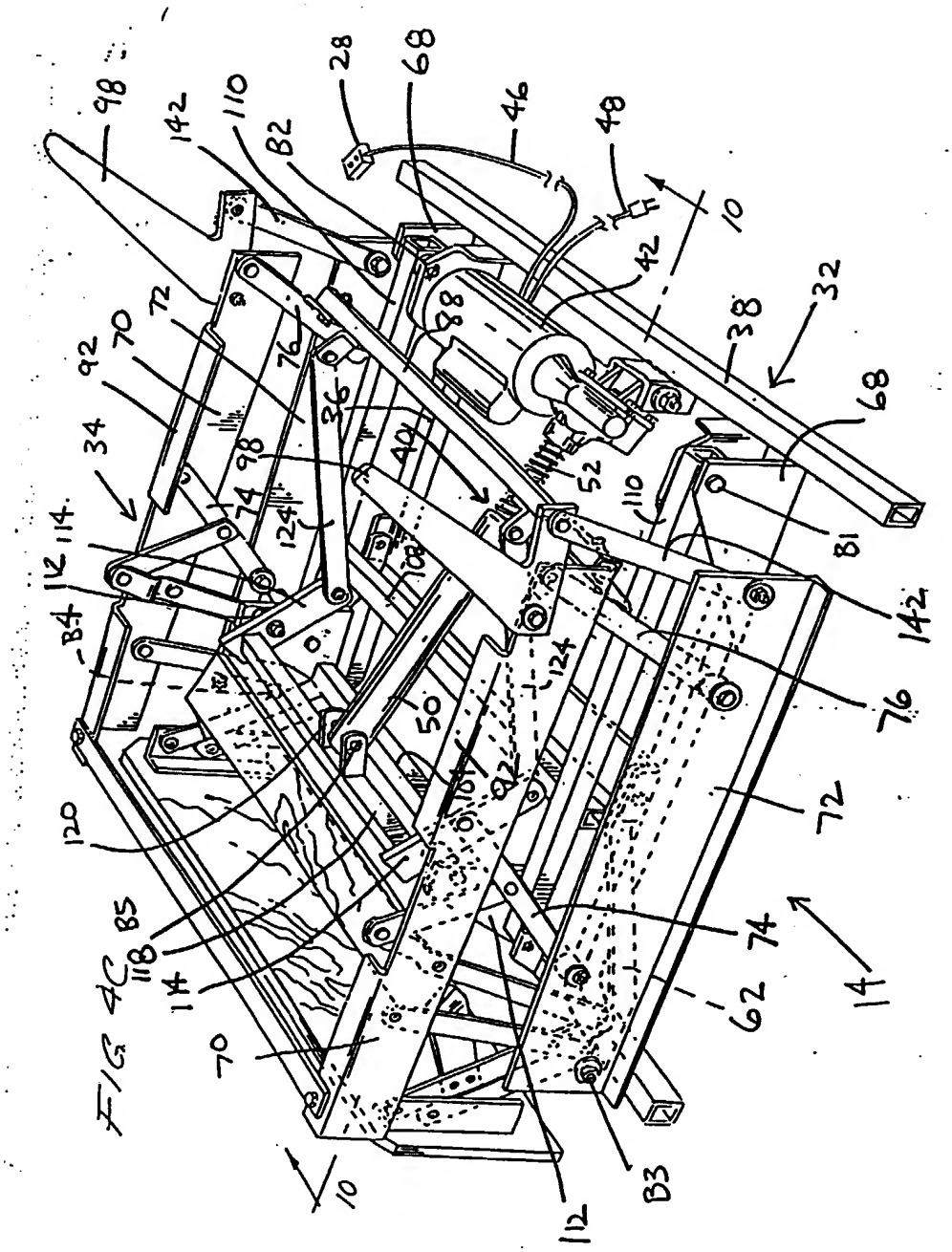
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FIG 4C

FIG. 5

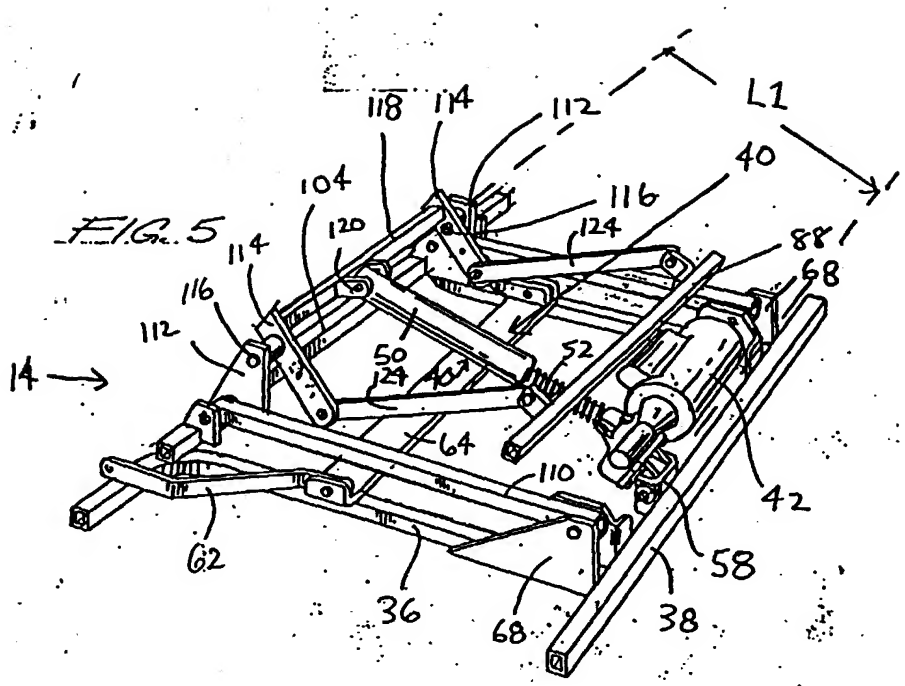
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FIG. 6

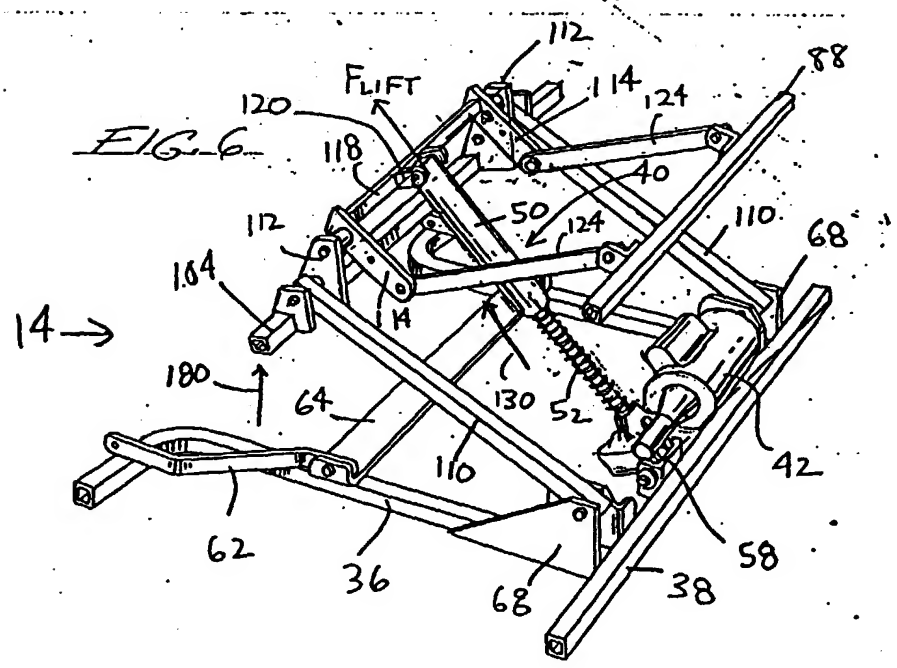
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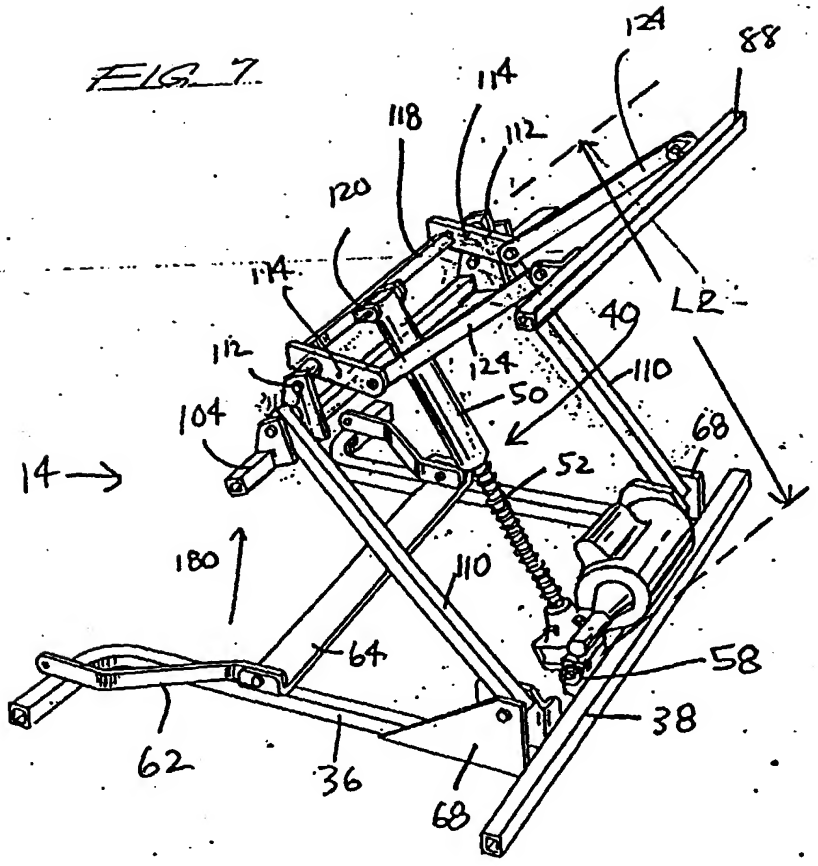
FIG. 7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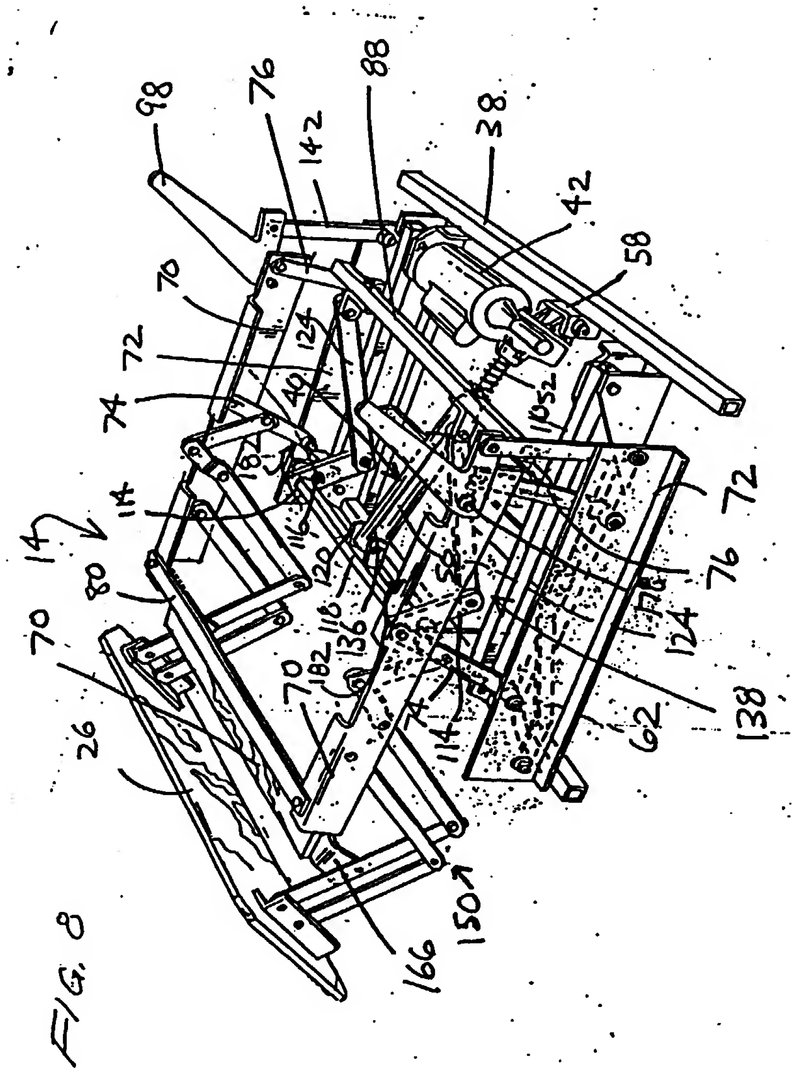
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FIG. 8

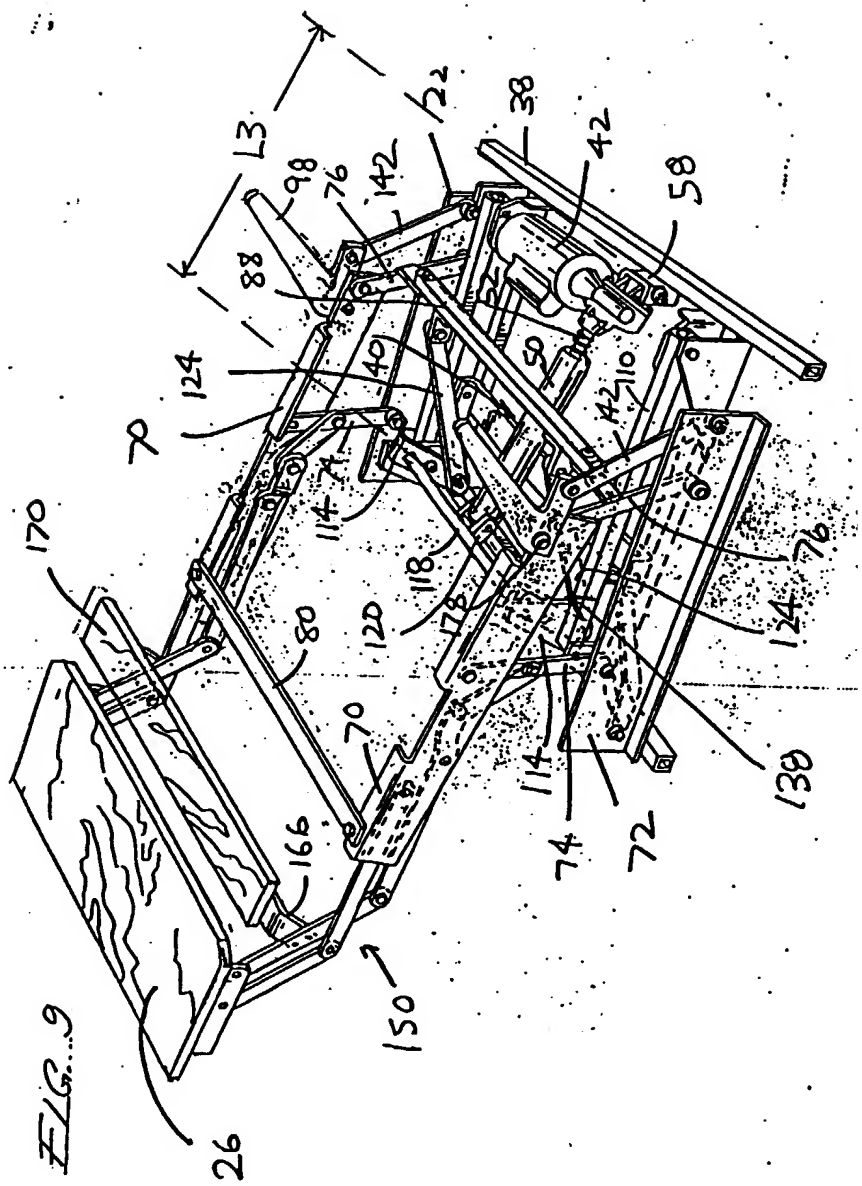
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FIG. 9

FIG. 10

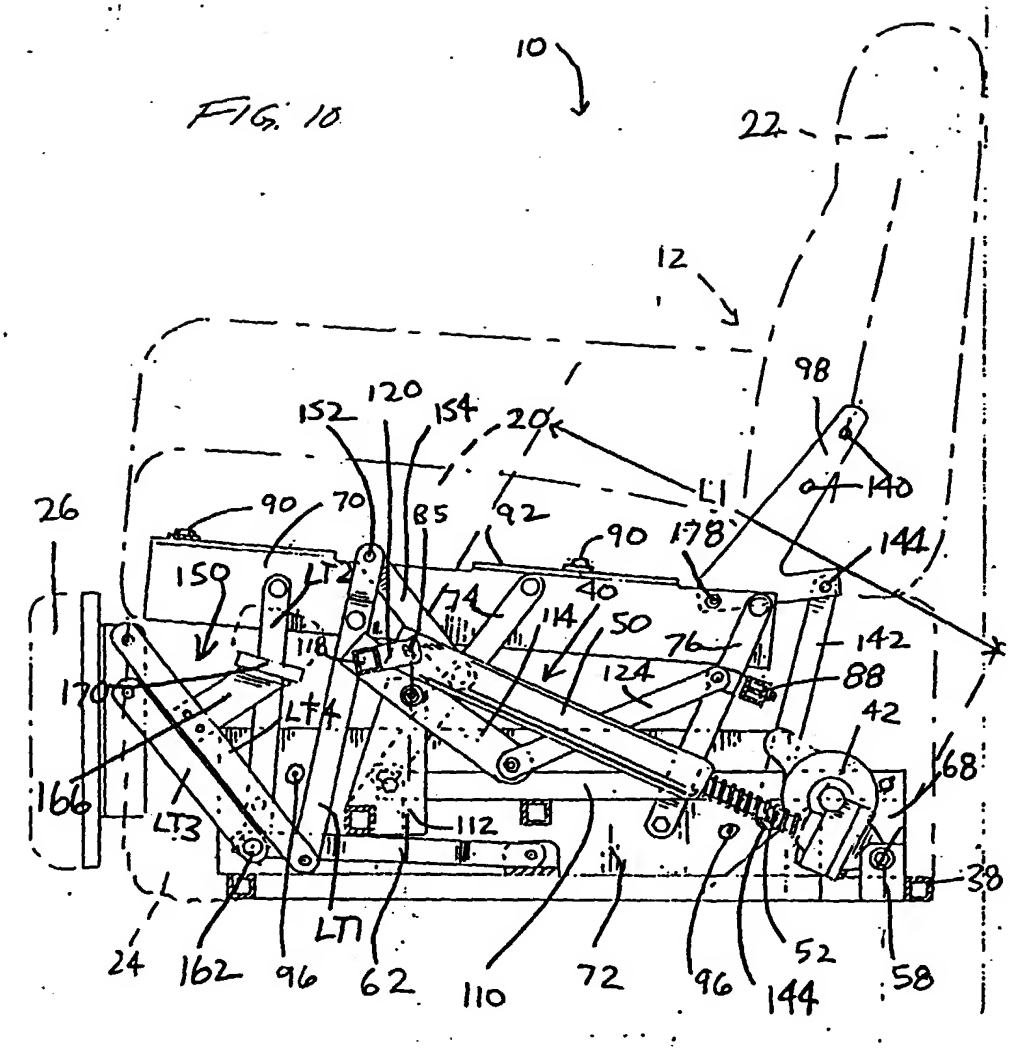
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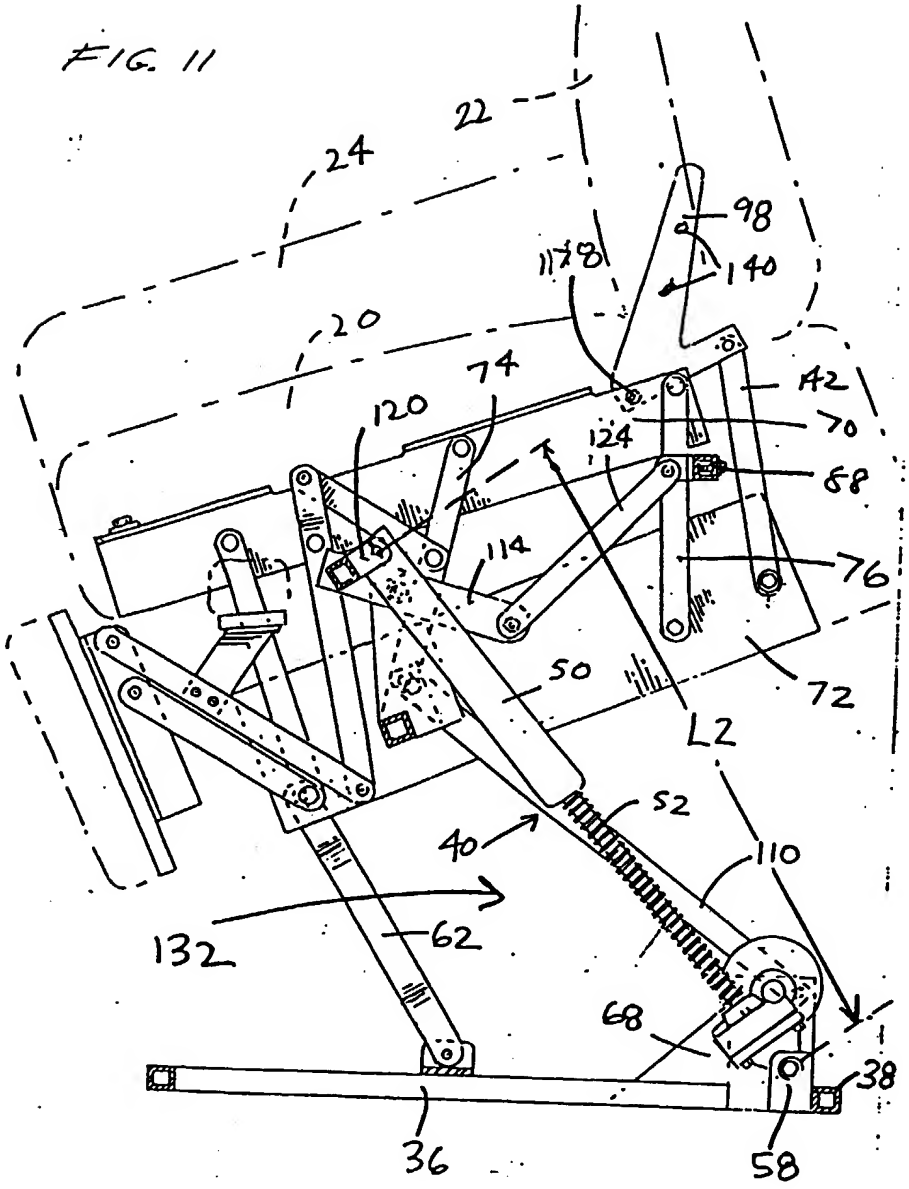
FIG. 11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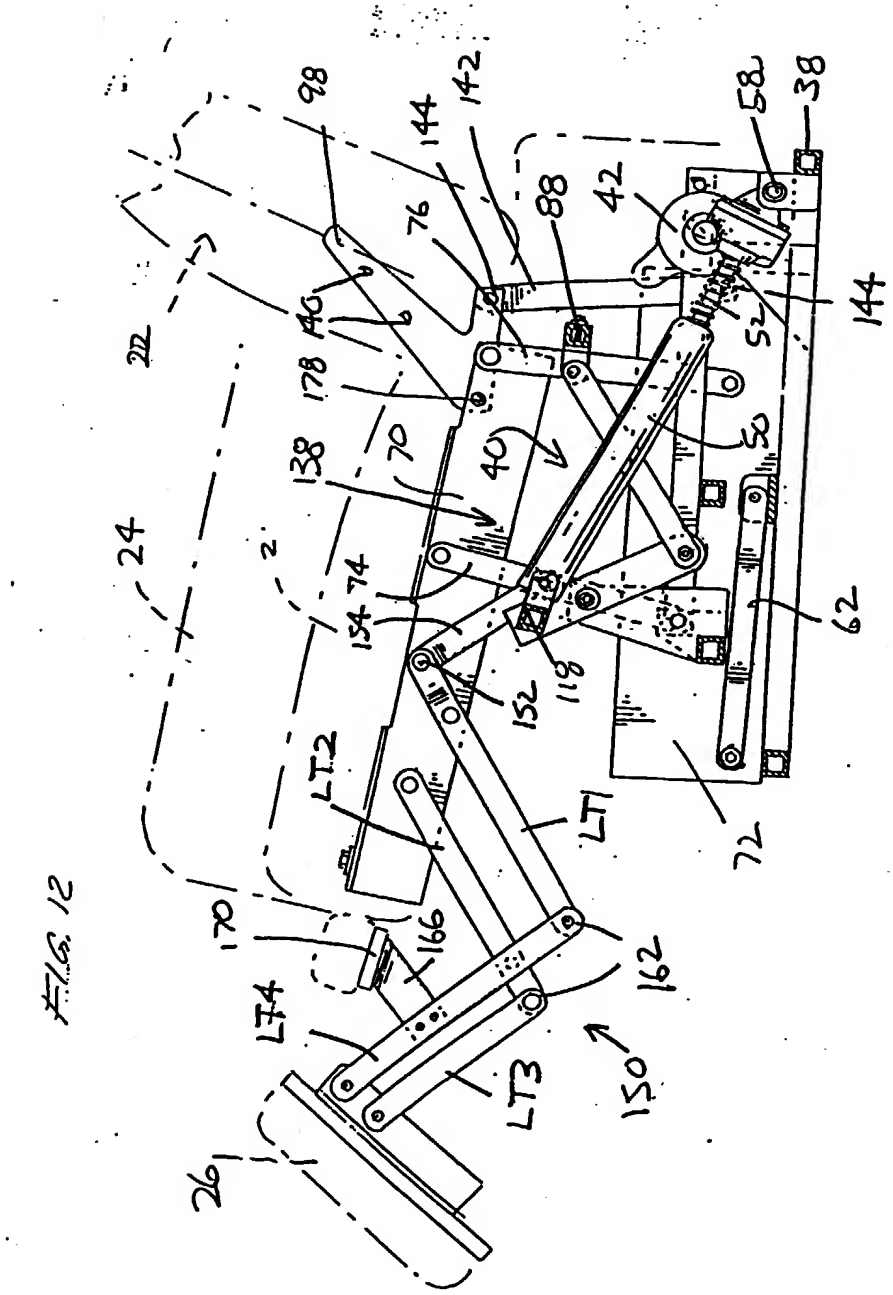
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Fig. 12

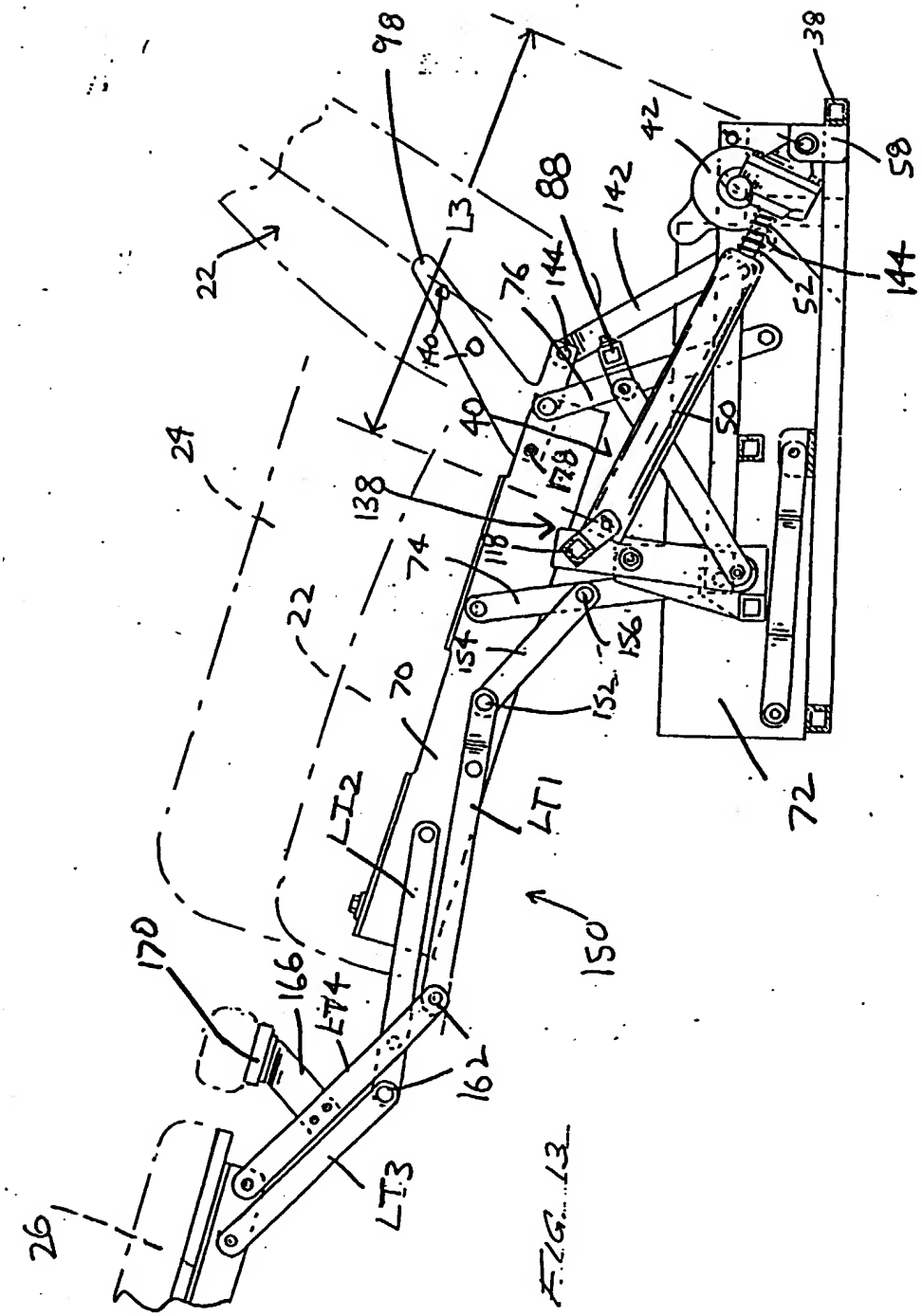
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FIG. 13

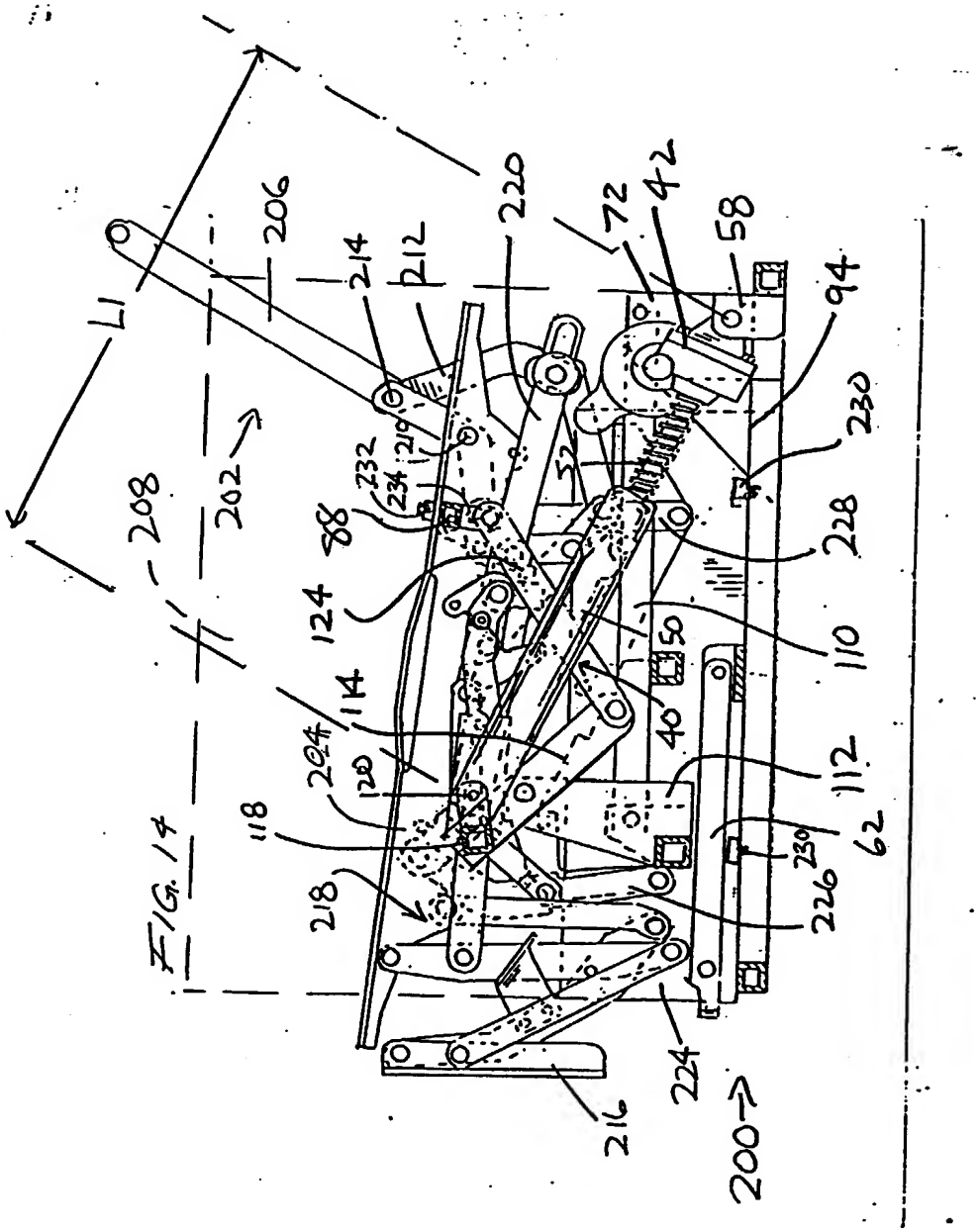
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FIG. 14

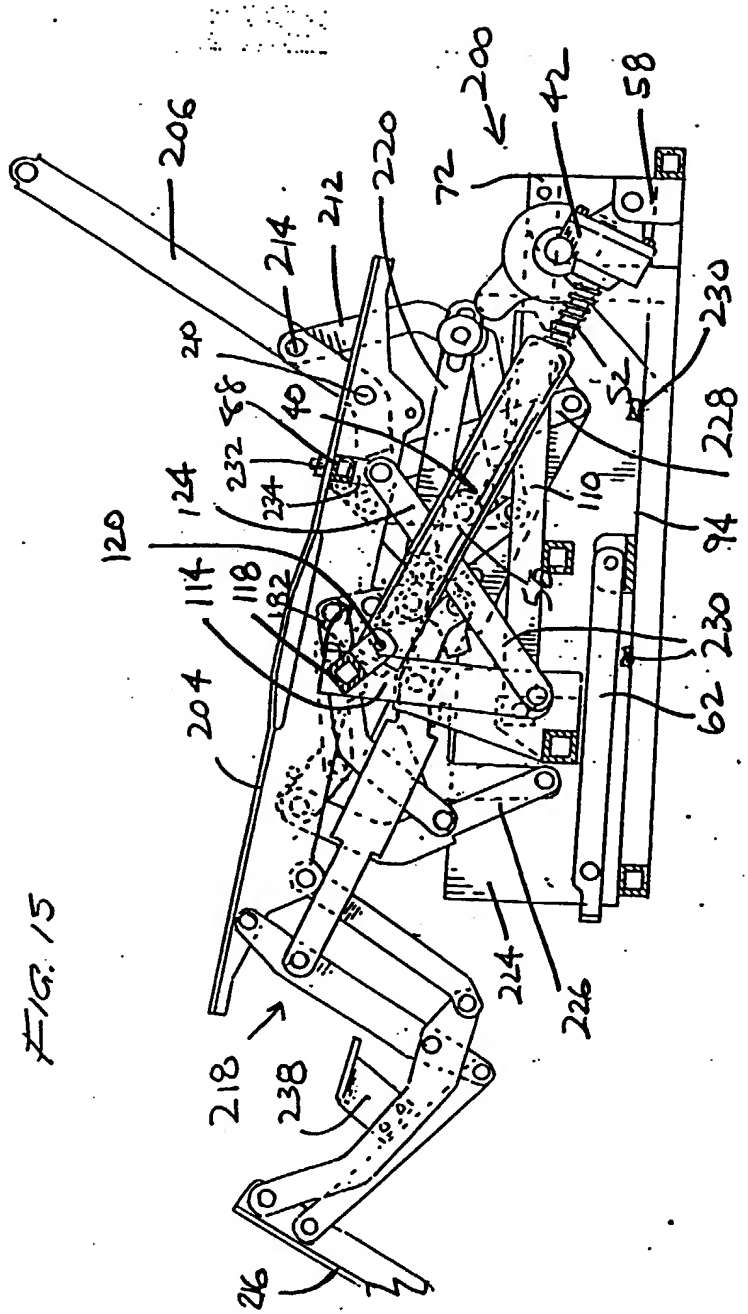
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FIG. 15

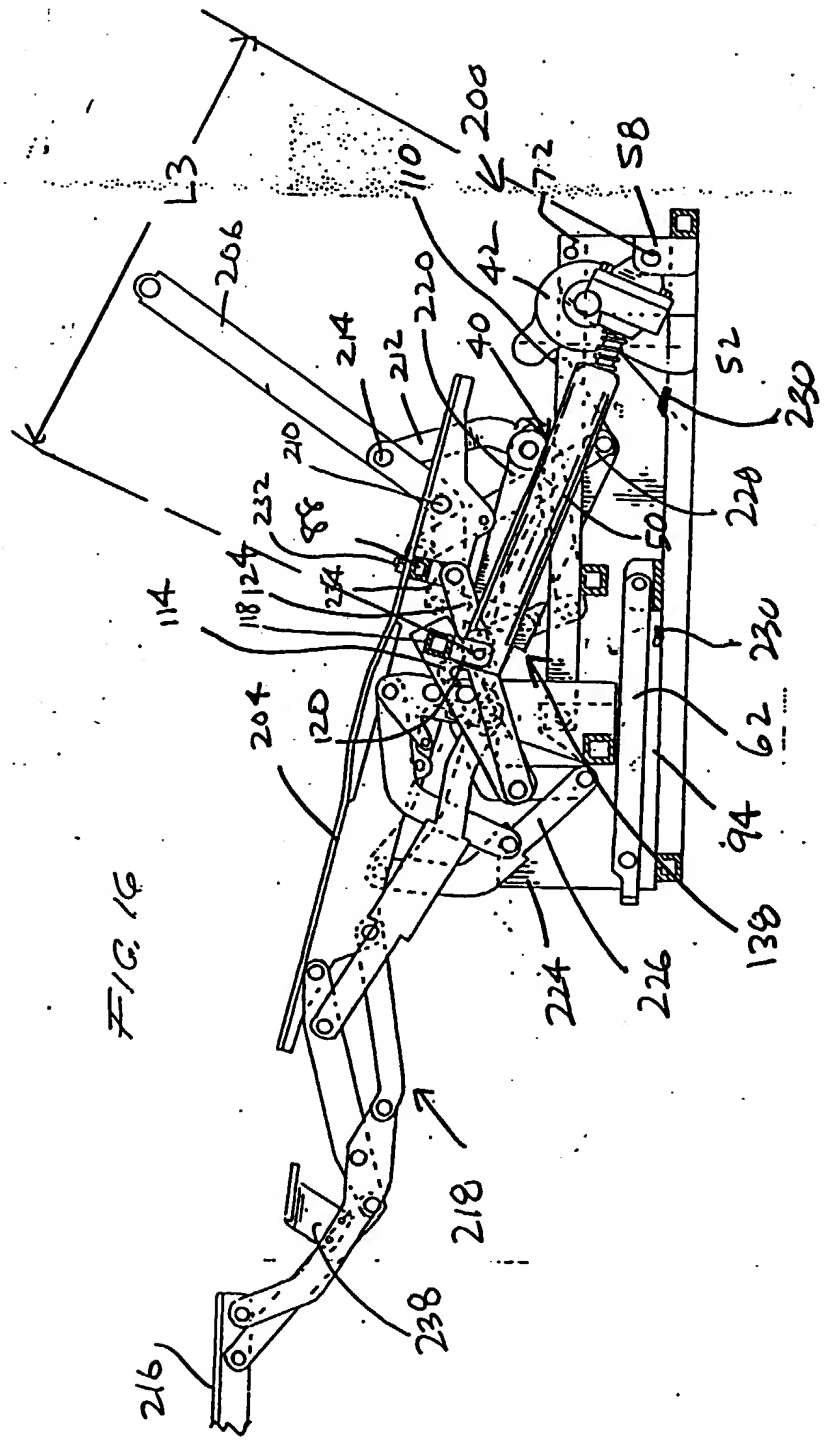
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FIG. 16

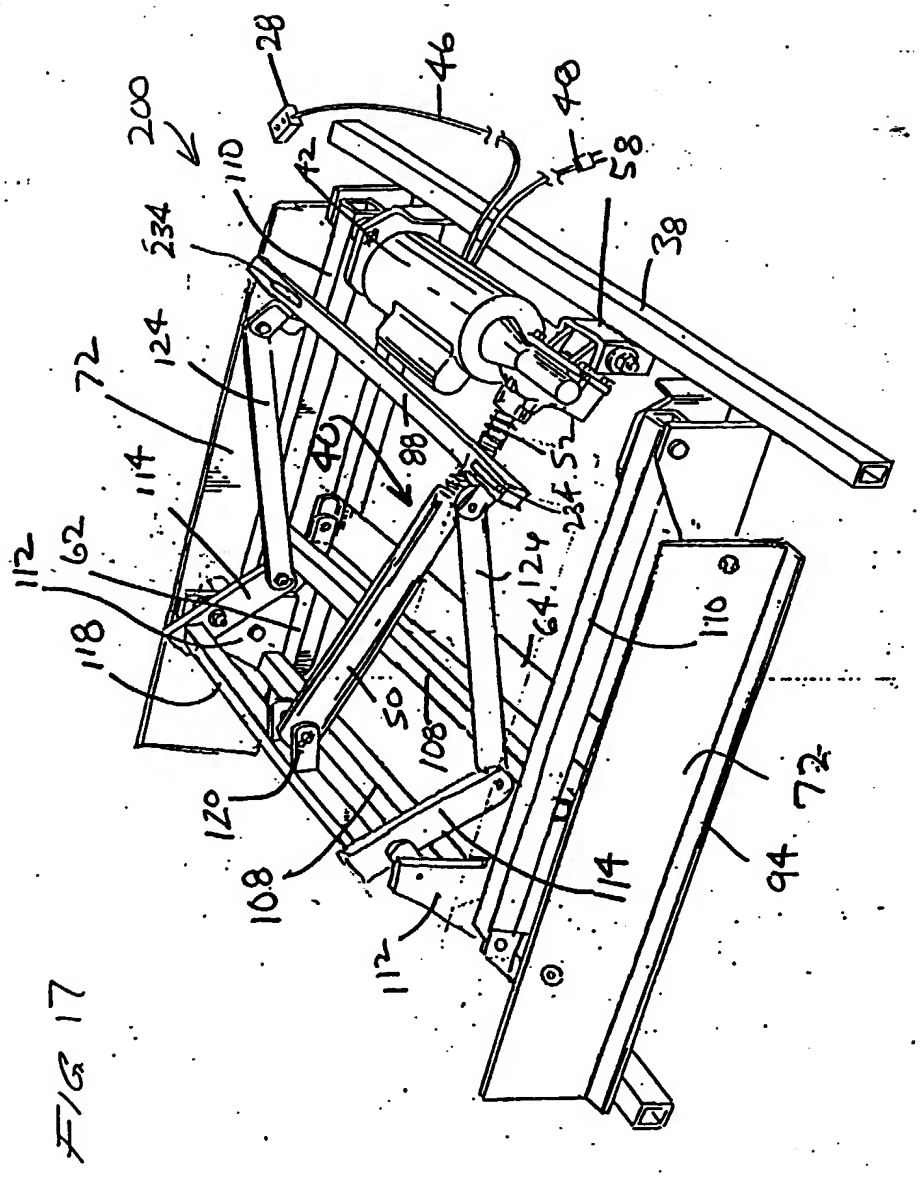
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FIG 17

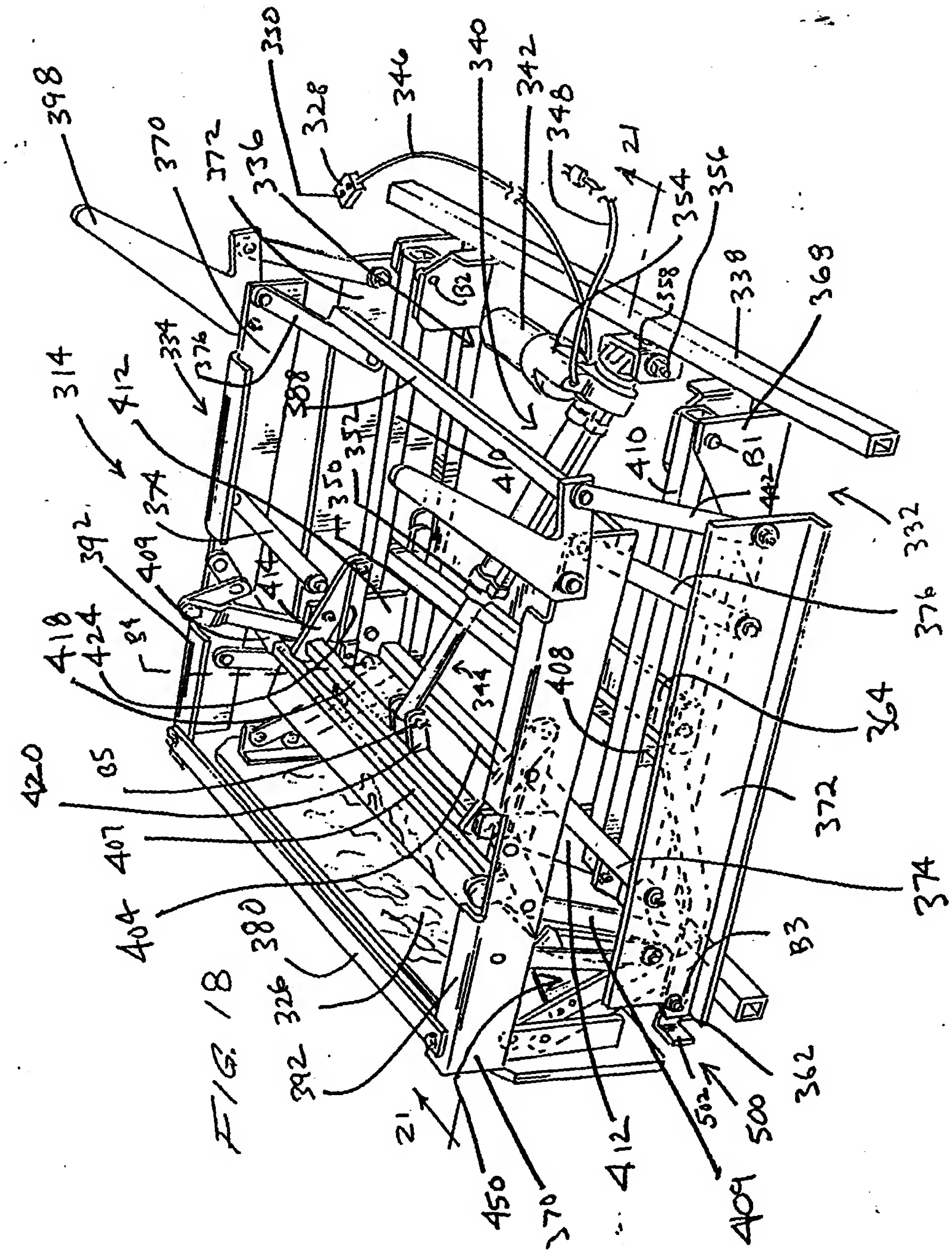

FIG. 18

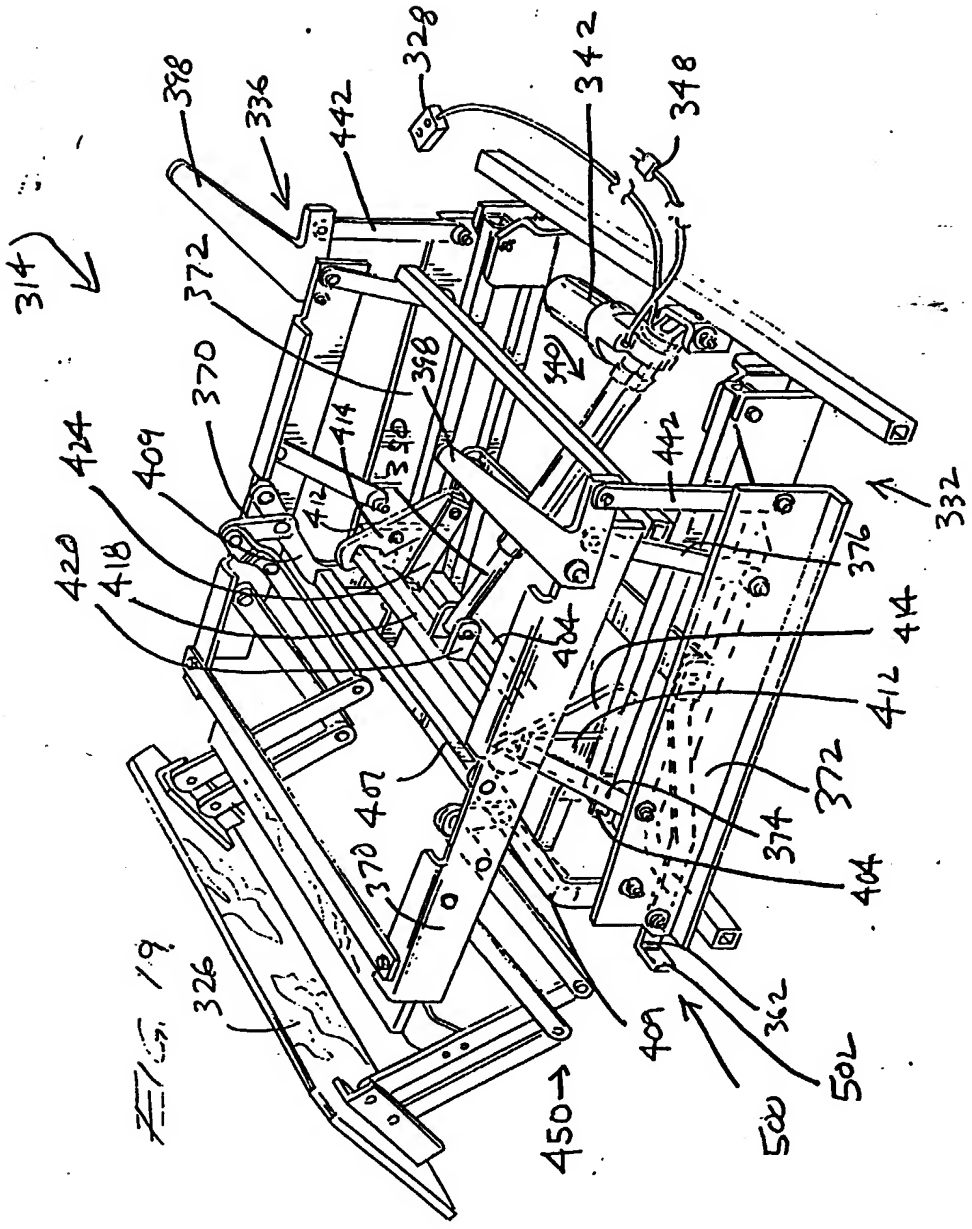
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Fig. 19

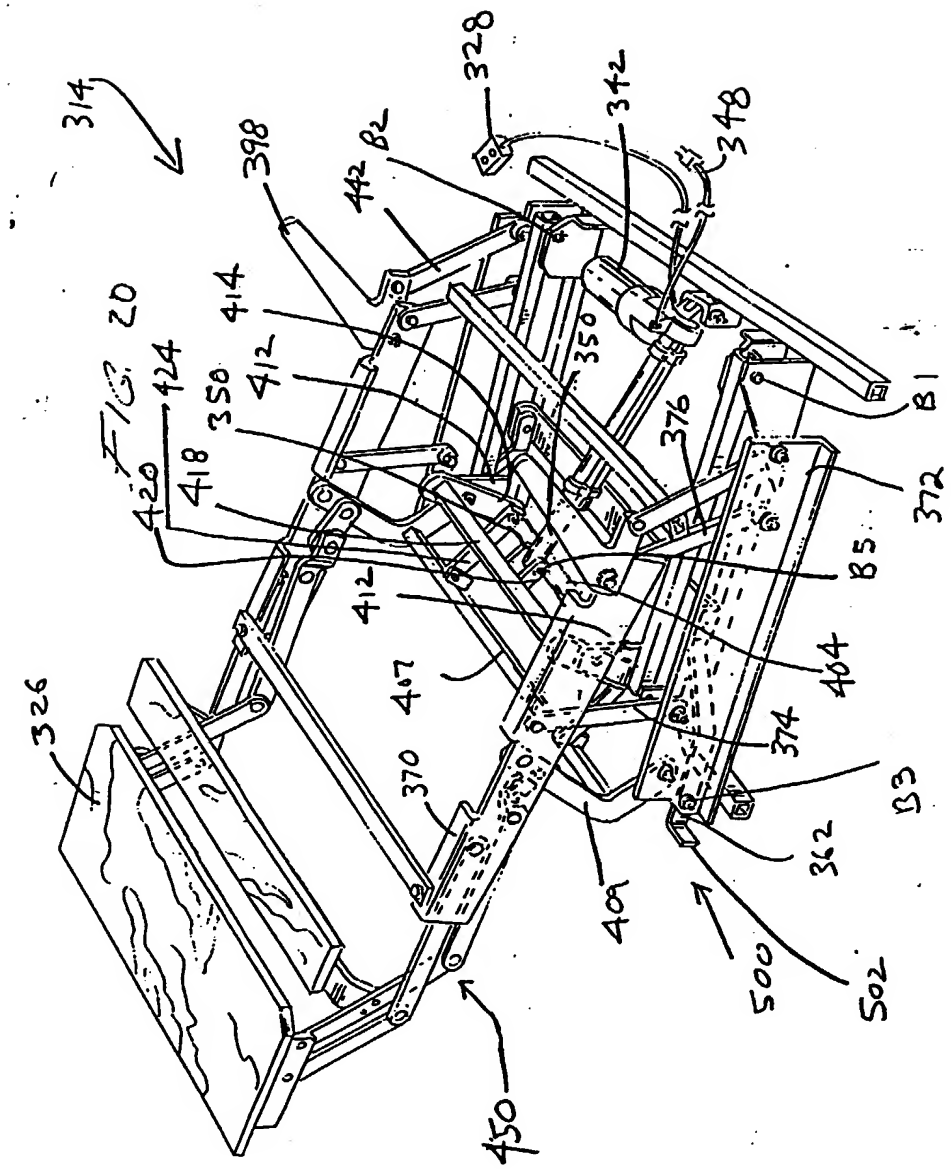
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FIG. 20

FIG. 21

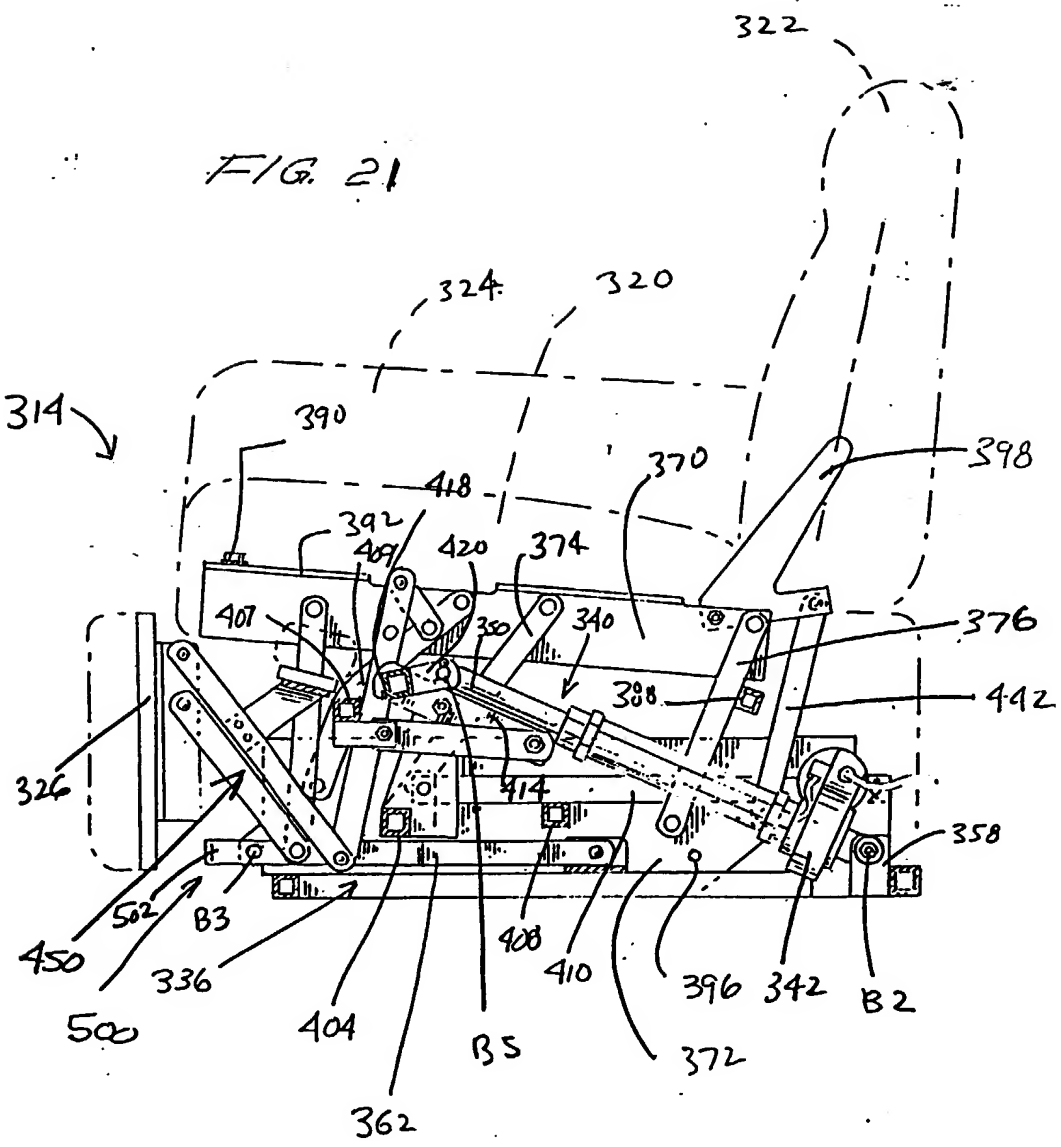
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FIG. 22

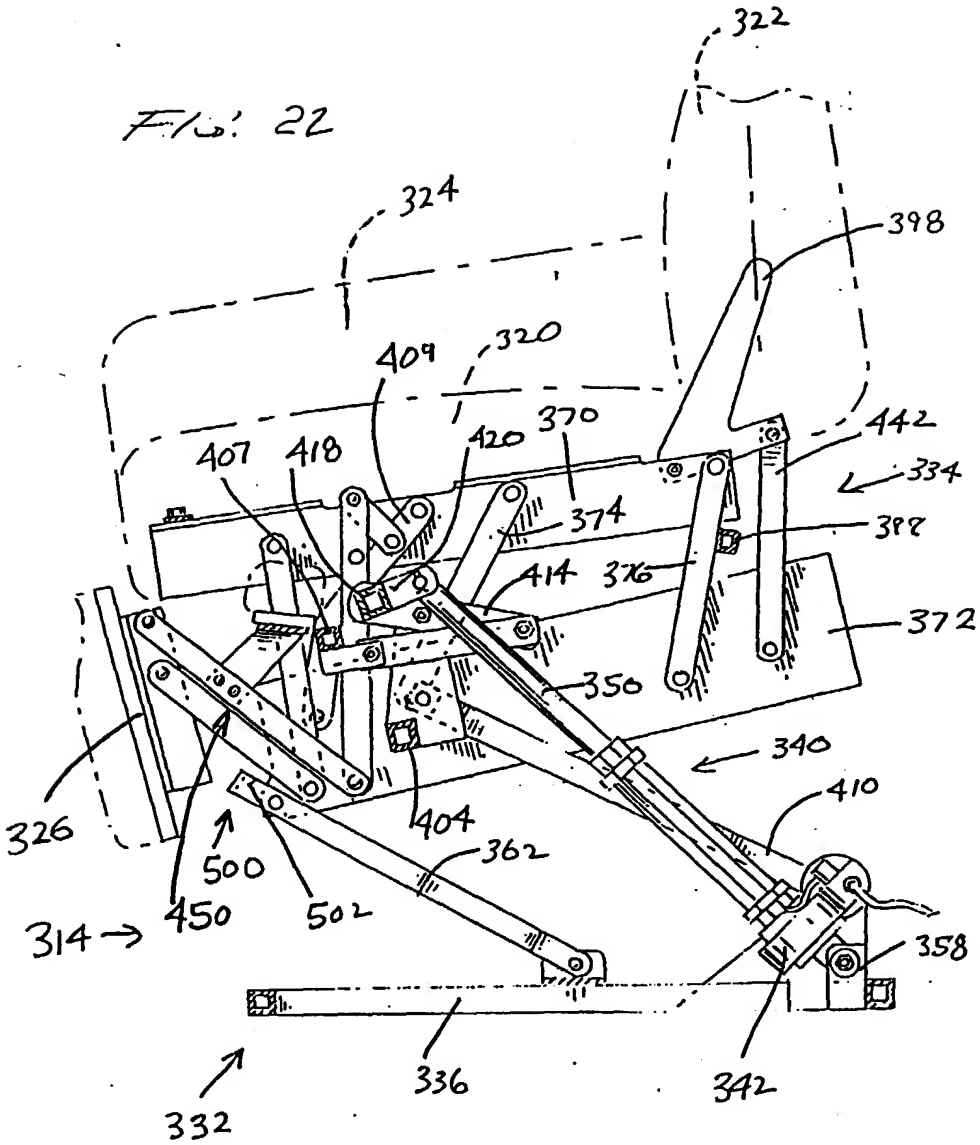
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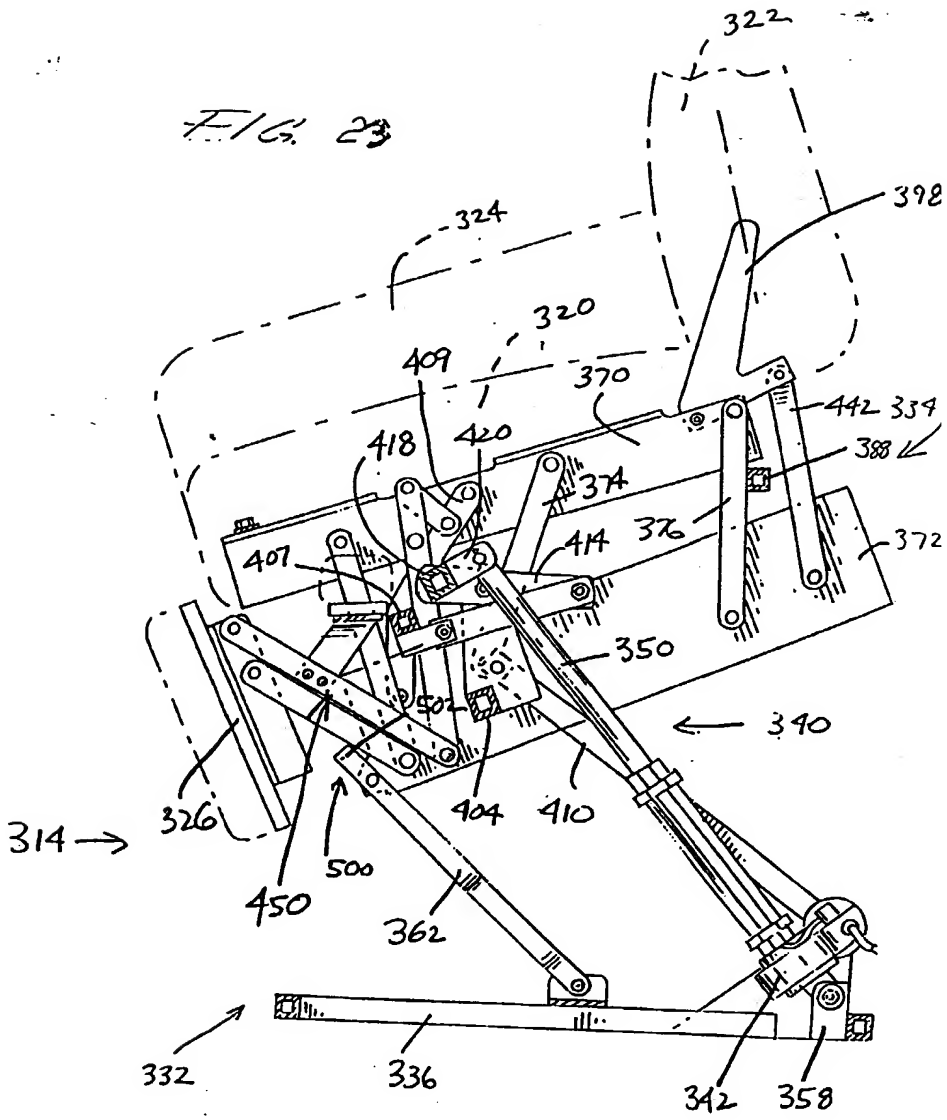
FIG. 23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332
336
342
358

FIG. 24

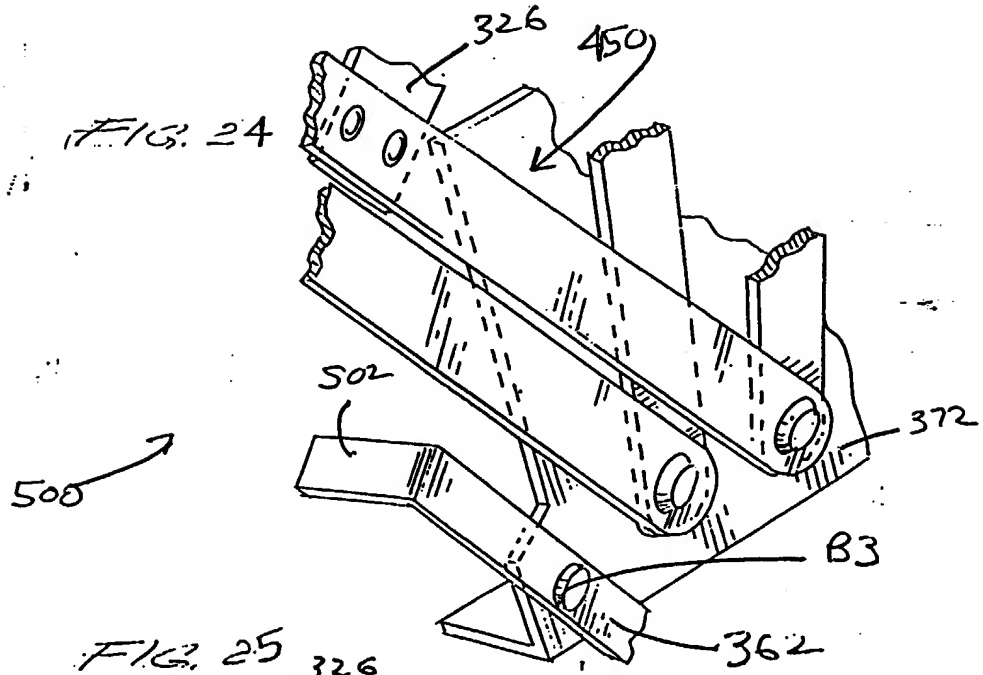


FIG. 25

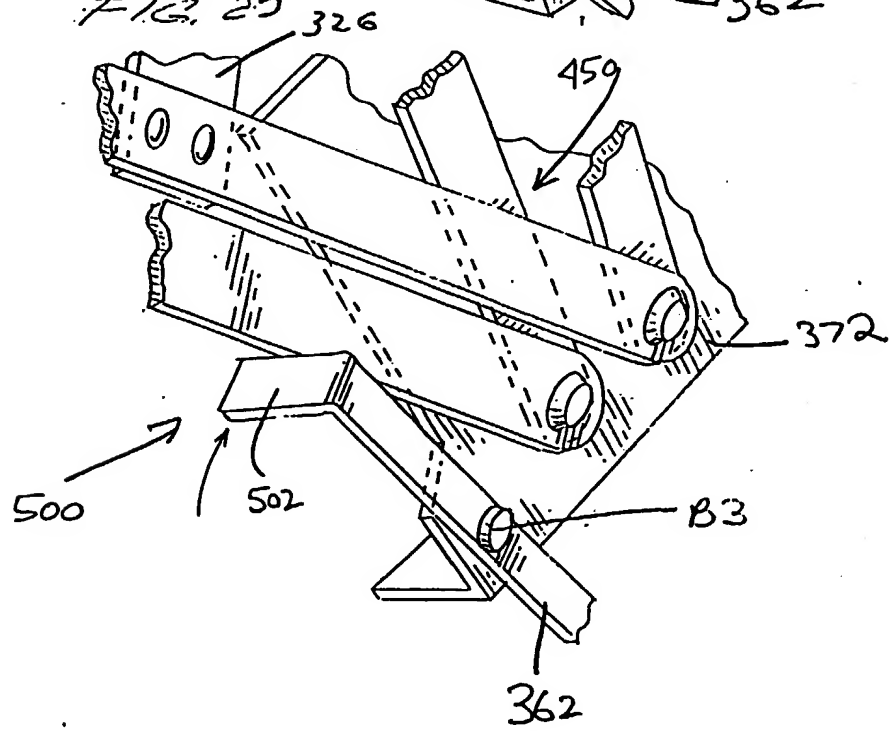


Fig. 26

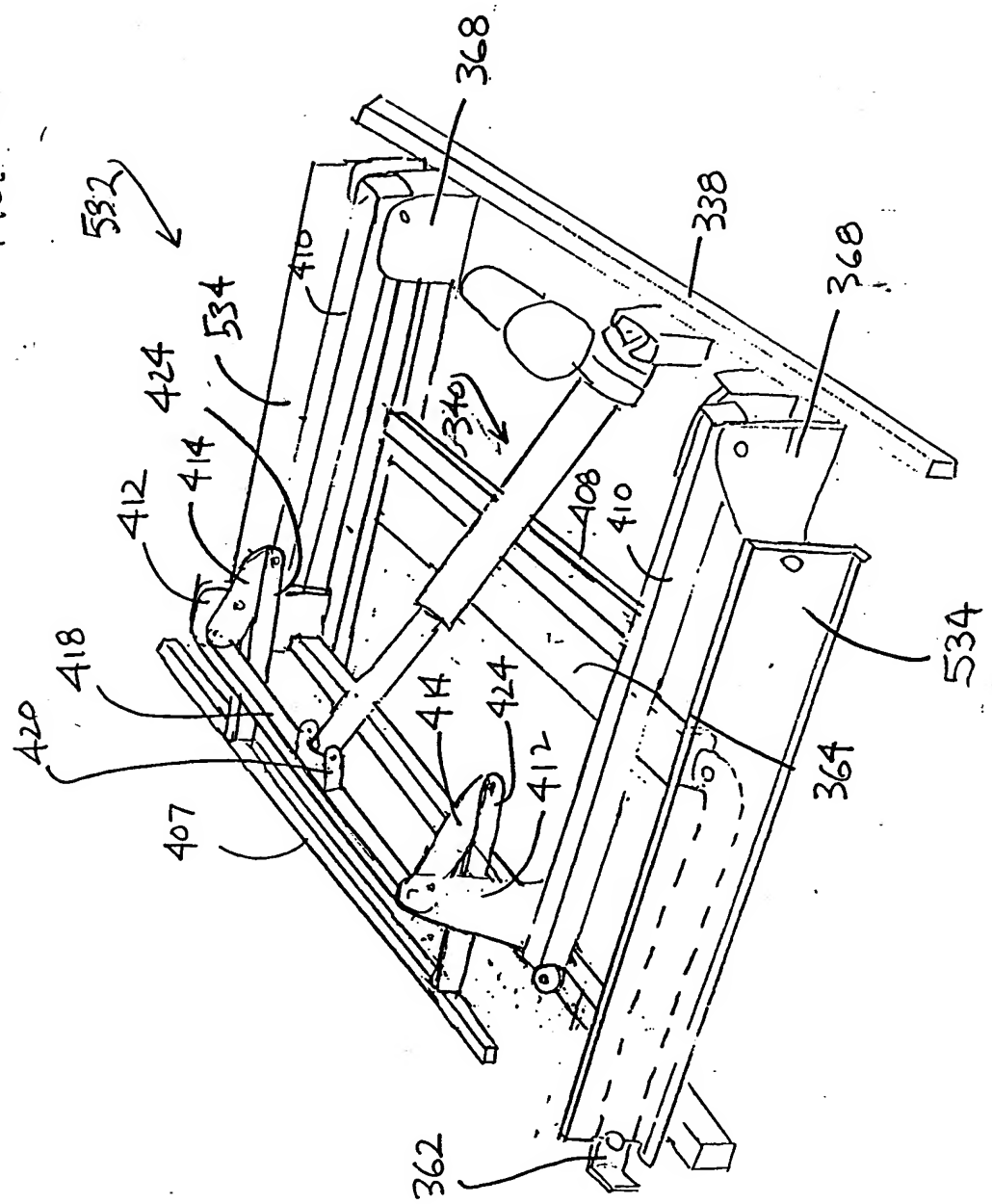

532
368
338
368
410
534
424
340
414
412
408
410
418
420
414
424
412
407
534
364
362

Fig. 27

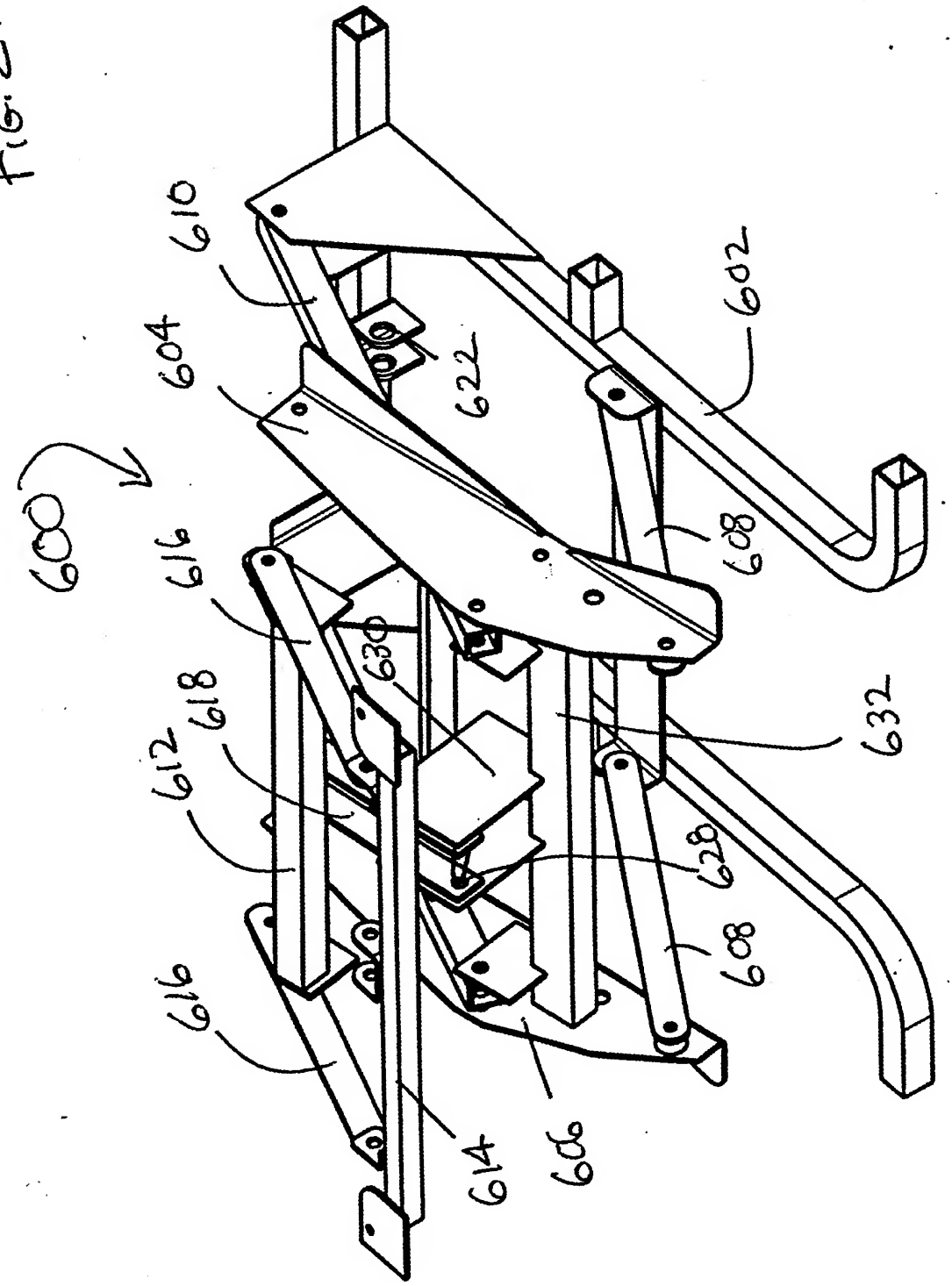


FIG. 28

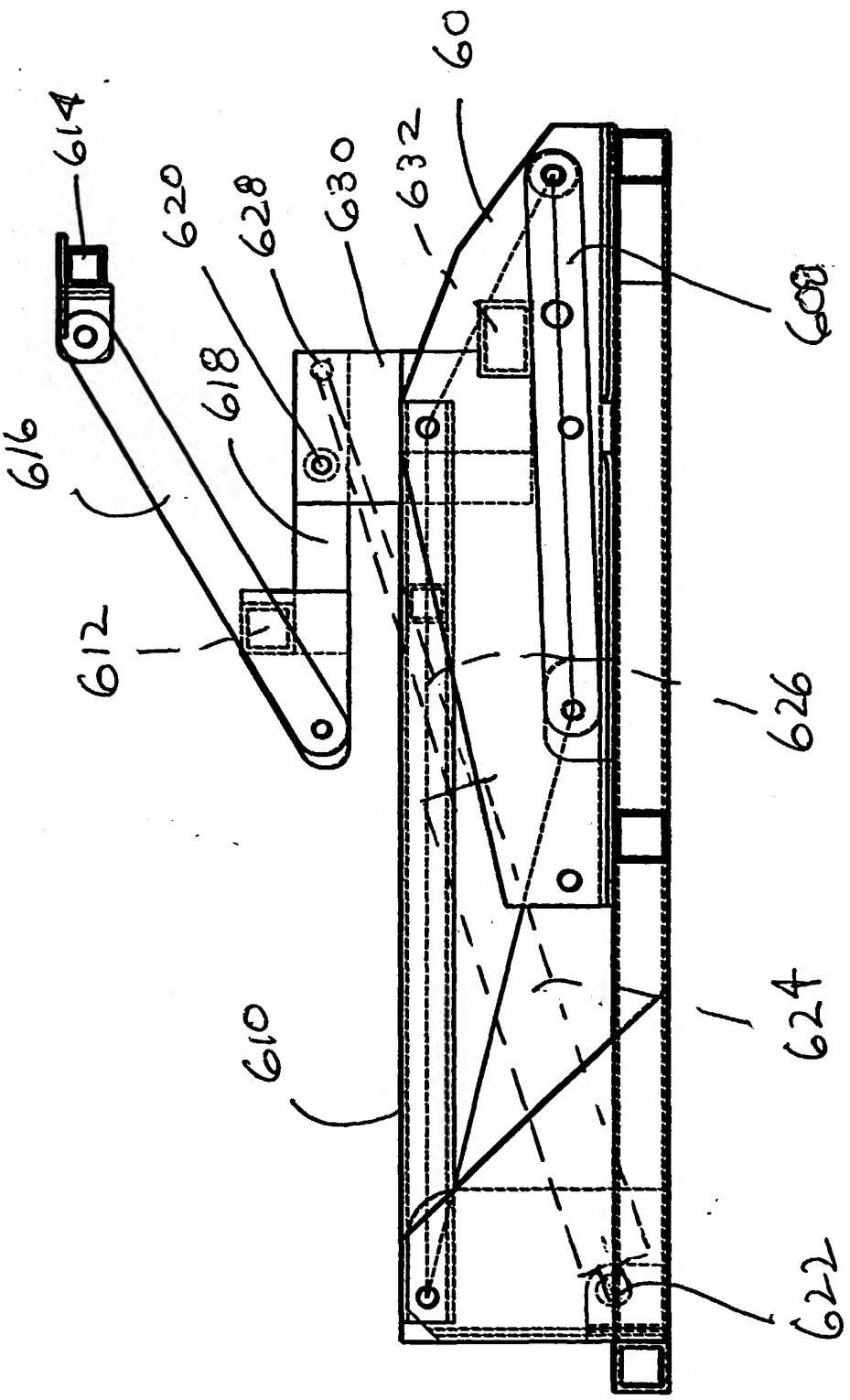
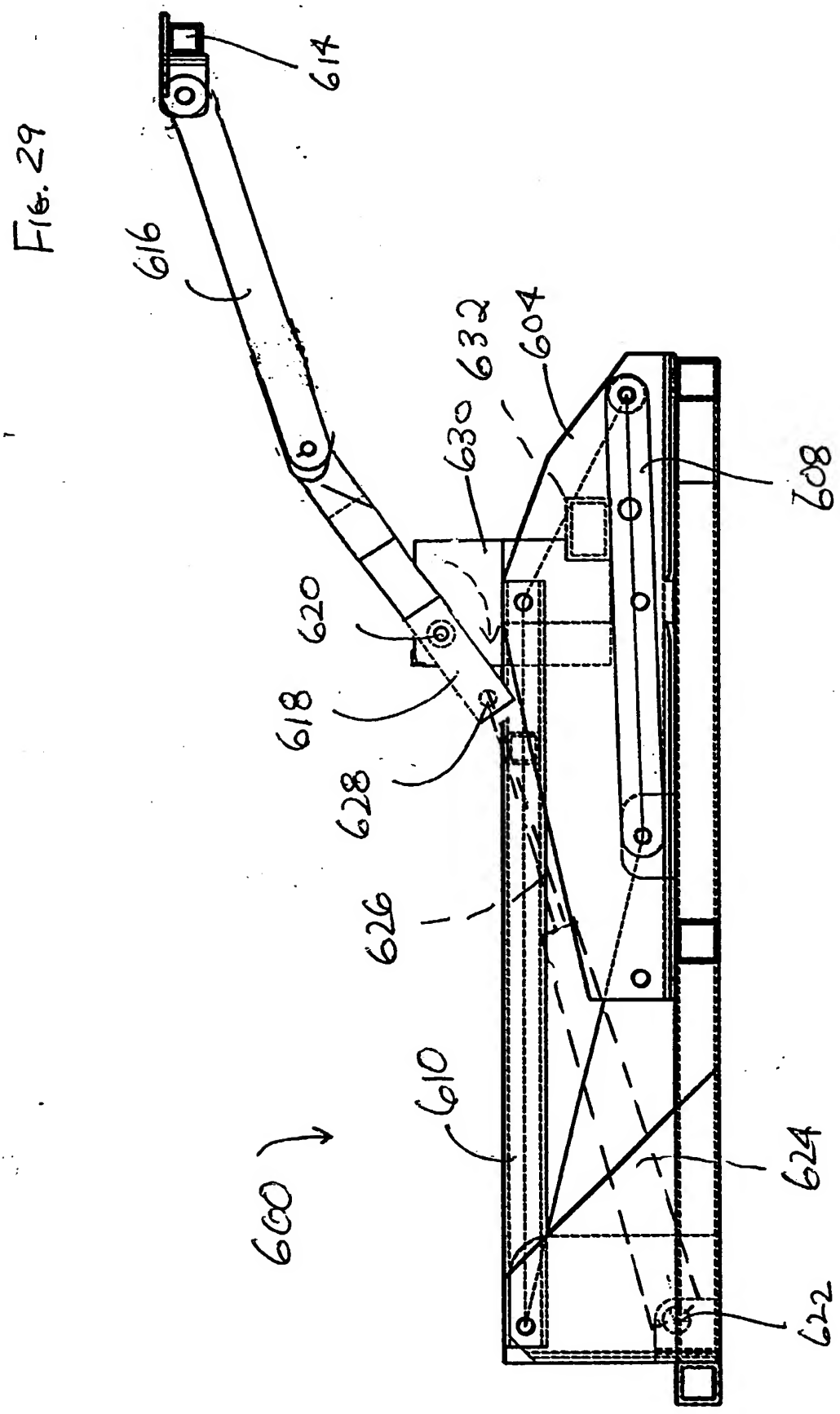


FIG. 29



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 30 8921

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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X Y	FR 2 235 580 A (BERKLINE CORP) 24 January 1975 (1975-01-24) * claim 1; figures 1-3 *	1 2	
X	DE 94 04 143 U (HOPPE KG HODRY METALLFAB) 9 June 1994 (1994-06-09) * figures 1,2 *	1	
E	EP 1 050 248 A (EDGTEC) 8 November 2000 (2000-11-08) * abstract *	1,2	
D,Y	US 4 007 960 A (GAFFNEY EDWARD J) 15 February 1977 (1977-02-15) * figures 2,4 *	2	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

A47C
A61G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22 December 2000	Joosting, T

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 30 8921

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The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

22-12-2000

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DERWENT-ACC-NO: 2001-292938

DERWENT-WEEK: 200262

TITLE: Reclining chair with wall-hugger function, maintains distance between adjacent wall and back rest constant, when back rest is in generally upright position and in generally reclined position

INVENTOR: GAFFNEY E J; ZAREMBA A ; ZAREMBA A L

PATENT-ASSIGNEE: EDGTEC[EDGTN] , GAFFNEY E J[GAFFI] , ZAREMBA A[ZAREI]

PRIORITY-DATA: 1999US-415744 (October 12, 1999) , 1999US-305972 (May 6, 1999) , 2002US-066898 (February 4, 2002)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
EP 1092371 A1	April 18, 2001	EN
US 20010035668 A1	November 1, 2001	EN
US 20020125746 A1	September 12, 2002	EN

DESIGNATED-STATES: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
EP 1092371A1	N/A	2000EP-308921	October 10, 2000
US20010035668A1	N/A	1999US-415744	October 12, 1999
US20020125746A1	N/A	2002US-066898	February 4, 2002

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	A47C1/032 20060101
CIPS	A47C1/034 20060101
CIPS	A61G5/14 20060101

RELATED-ACC-NO: 2000-666546

ABSTRACTED-PUB-NO: EP 1092371 A1

BASIC-ABSTRACT:

NOVELTY - The reclining linkage assembly pushes the forward thrust bar in response to actuator operation, to advance the seat (20) and back rest (22) forward while tilting back rest rearward from generally upright position to reclined position. The distance between the back rest and adjacent wall remains generally constant when the back rest is in the generally upright position and in the generally reclined position.

DESCRIPTION - The reclining linkage assembly is coupled to an actuator on the base (14). The assembly includes a forward thrust bar on the base adapted to be coupled to the front portion of the seat of the chair. The assembly is operable in response to the operation of the actuator for applying a pushing force to the forward thrust bar.

USE - Reclining chair with wall-hugger function.

ADVANTAGE - Provides a reliable, straight forward, power driven reclining function with a wall hugging feature. The recline mode is designed to give a wide range of comfortable positions to the occupant while seated for various activities such as reading, watching television, resting or sleeping.

DESCRIPTION OF DRAWING(S) - The figure shows the perspective front side view of reclining chair in elevated position, lifted about the mechanized base.

Base (14)

Seat (20)

Back rest (22)

CHOSEN-DRAWING: Dwg.2/29

TITLE-TERMS: RECLINING CHAIR WALL FUNCTION MAINTAIN DISTANCE ADJACENT BACK REST CONSTANT GENERAL UPRIGHT POSITION

DERWENT-CLASS: P26 P33 X27

EPI-CODES: X27-A03;

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: 2001-209474